FOOD MANUFACTURE

LEONARD HILL LIMITED, 17, STRATFORD PLACE, LONDON, W.1 NOVEMBER 1, 1945

PHILIPS LAMPS

ARE GOOD LAMPS

buy them - they save electricity

PHILIPS LAMPS LTD · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · WC2

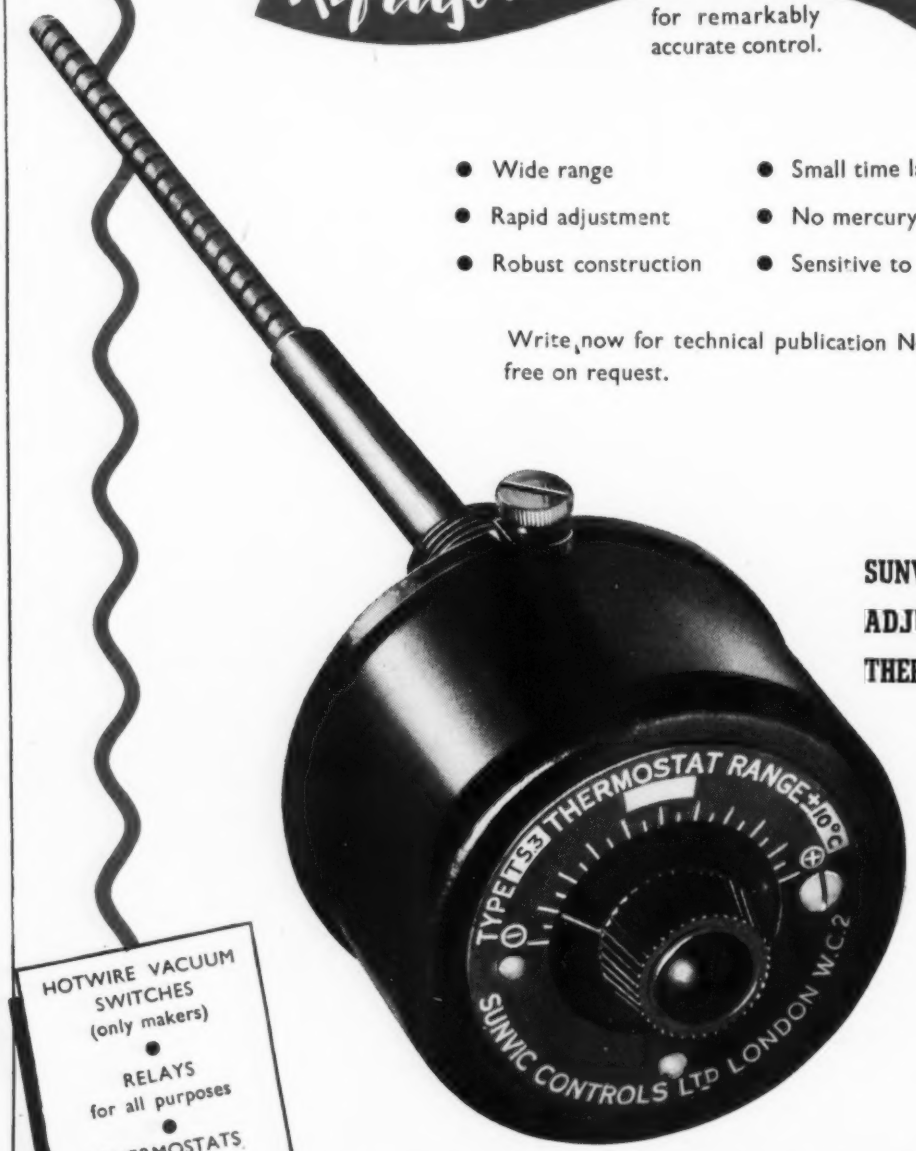
SUNVIC — CONTROL SIMPLIFIED ELECTRICALLY

Refrigerator Thermostat

for remarkably
accurate control.

- Wide range
- Rapid adjustment
- Robust construction
- Small time lag
- No mercury or glass
- Sensitive to $\frac{1}{10}$° C.

Write now for technical publication No. 109-2/9 free on request.



**SUNVIC T.S.3
ADJUSTABLE
THERMOSTAT**

HOTWIRE VACUUM SWITCHES (only makers)
●
RELAYS for all purposes
●
THERMOSTATS
●
ENERGY REGULATORS

SUNVIC CONTROLS LIMITED
NO. 1, KINGSWAY LONDON, W.C.2

TAS/SC.41

FOOD MANUFACTURE

Vol. XVIII, No. 11 November 1, 1943

Contents

	Page
Editorial	359
Fluorescence Analysis in the Food Industry. Part I. J. A. Radley, M.Sc., F.I.C.	363
Hydrogenated Fats. Part I. H. R. Mitchell, M.I.Chem.E.	369
Diet and the Common Cold	373
Books Received	374
Ministry of Food: Latest Statutory Rules and Orders	375
Colloid Chemistry in Food Manufacture. J. J. Bikerman	377
Fire and Food Stocks	380
Fuel Supplies and Food	381
Problems of Freed Europe	382
Flavour and Food. Part II. R. W. Moncrieff, B.Sc.	383
Cheap Food	384
Food Poisoning	385
Food Education Society	386
Maintenance of Plant in Closed Factories	386
News from the Industry	387
Information and Advice	395
Recent Patents, Trade Marks and New Companies	396

Published on the first day of the Month
by
LEONARD HILL LIMITED
17, Stratford Place, London, W.1
Telephone: Mayfair 7383

SUBSCRIPTION

Single Copies	1s.
Annual Subscription	10s.
Abroad	12s. 6d.

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

The Ice Cream Position

FOLLOWING representations by the Milk Bars Association, the Ministry of Food is considering whether some relaxation of the provisions of the Ice Cream (Prohibition of Manufacture and Sales) Order can be made. A decision is expected to be made in ample time for the 1944 season. After the Clerkenwell "test" case, the Association called the attention of the Ministry to the fact that the substitute product upheld by the court was free from the restrictions regarding the use of milk which applied to the manufacture of ice cream before its total prohibition, and that it was unfair to firms in the habit of producing the genuine article for consumption and sale on their premises that the prohibition should be maintained while the substitute article was successfully exploited. Prohibition of ice cream merely created a demand for the substitute, the production and transport of which might well be less economical than that of ice cream.

"The position is now intolerable and insupportable," wrote the Association, "and it is strongly urged that there should be an immediate removal of the prohibition of the manufacture and sale of ice cream. It is inconceivable that the Ministry will remain committed to a decision which was ill-founded, when circumstances have destroyed its effectiveness. It cannot be the intention of the Ministry to allow manufacturers of substitute ice cream to obtain an advantage over the producers of the genuine article." The Ministry has intimated that the matter is being considered and that the catering trade will be kept informed of developments.

It was stated at a Press conference at the Ministry last April that the prohibition of the manufacture of ice cream was due to questions of labour and transport and not to shortage of ingredients. It is therefore believed that any modification that may be made in the Prohibition Order will apply only to manufacture for sale on the premises, as such firms use no additional labour, no transport and no packaging materials. Lord Woolton stated when the Order came into force that prohibition was applied to all sections of the industry "to prevent anomalies". The Milk Bars Association is declared to have shown that the Order has created as many anomalies as it has prevented.

Food Facts and Fallacies

There was a large attendance at a recent meeting of the newly-constituted Food Education Society, at which Professor R. H. A. Plimmer gave a lecture on "Food Facts and Fallacies".

Professor Plimmer, with extensive use of chalk and blackboard, which took us back in memory to student days, gave a particularly lucid account of the implications of proteins, carbohydrates, fats, etc., with special reference to wartime diet. He set the seal of scientific approval upon dehydrated foods but pricked the bubbles of several persistent and favourite fallacies.

We well remember in boyhood days the feeling of increased brain power resulting from the consumption of our breakfast kipper (we had been told that phosphorus had something to do with it), but while Professor Plimmer eulogised herrings and mackerel as diet he scouted the idea of their effect on the brain.

Discussing middle-age-spread, the Professor underlined the fact that fat comes from food. He put forward the virtues of cabbage heart in favour of celery; recommended acid fruits, which were not injurious to health; and supported a daily requirement of 2,200-3,000 Calories—a number less than that laid down by some authorities.

Professor Plimmer is an advocate of wholemeal bread, but considers that the present National bread is a great advance towards the ideal loaf. He made a special plea to housewives not to use the children's ration of meat and dairy products to augment those of the father or adult members of the family, and emphasised the value of the soya grit sausage.

Post-War Milk Policy

Post-war reconstruction of the milk industry throughout England and Wales has been carried a stage further. The Ministry of Food has asked the Central Milk Distributive Committee to prepare in detail a scheme for the establishment of a Distributors' and Manufacturers' Board on the lines mentioned in the memorandum on post-war policy that was submitted to the Government early in August. The C.M.D.C. has appointed a sub-committee to draft the scheme.

It is believed that the sub-committee will take the dormant milk products marketing scheme as a base on which to build the new structure and will adapt that scheme so as to embrace liquid distribution as well as milk manufacture. The milk products scheme, which the C.M.D.C. suggests should be abandoned, was designed to apply to creameries that used a certain minimum gallonage or over in the manufacture of cheese, butter, condensed milk and milk powder. An important matter that the sub-committee will examine is whether the minimum gallonage clause should be eliminated and the range of control extended to cover all products and by-products of milk manufacture.

The reason for this suggestion is that the post-war policy as outlined by the C.M.D.C. visualises the control and marketing of *all* milk and milk products under the central direction of a Milk Industry Council. It will therefore probably be desirable, if not essential, that the Distributors and Manufacturers Board should control every distributor of liquid milk whether wholesaler or retailer, and also every manufacturer irrespective of the gallonage handled in all cases. The White Paper on the improvement of milk quality provides for the establishment in certain circumstances of municipal heat-treatment centres for milk. Such centres would presumably come within the marketing scheme, as these local authorities would be regarded as and remunerated as milk wholesalers. The position of milk producer-retailers may present some difficulty. At present they are registered with the Milk Marketing Board, though many of them are members of distributive organisations.

The fact that the Ministry of Food has asked the C.M.D.C. to prepare a marketing scheme in detail does *not* signify that the Government has accepted the policy. The task of the C.M.D.C. will be limited to the drafting of the marketing scheme for milk distribution and manufacture.

"Pure" Milk

For the moment the violence of the pasteurisation controversy has abated and it seems almost a pity to say anything that might rekindle the flame. We cannot, however, resist the temptation of quoting from a letter by Dr. Marie Stopes published in a recent number of *New Health*.

Dr. Stopes states that "few people in the country realise the imminent danger of universal compulsory pasteurisation of all milk".

"As the attempt to rush this abomination on us appears to be based on Dr. G. S. Wilson's arguments as a bacteriologist, the public may not realise that the science of life contains much outside the scope of bacteriology."

She quotes from a letter she wrote to Lord Woolton (the excerpt is too long to give in full here), in which she states that "as the Founder of Mothers' Clinics twenty years ago I have had many opportunities of direct observation on the subject of pasteurisation". Having described the effect of pasteurised milk on a boy of sixteen who had hitherto taken nothing but raw milk, she concludes: "Please record on your conscience at least my explicit prediction that if you compel pasteurisation you will not decrease the amount of tuberculosis in this country but increase it, and pasteurisation will bring in its train a host of other evils. Treat people who want to drink *pure, untampered milk* fairly and honestly." Evidently Dr. Stopes, when she uses the word "pure", leaves bacteriology outside its scope?

Freezing Point of Benzoic Acid as a Thermometric Fixed Point

Some months ago experiments were completed on the use of the freezing point of benzoic acid as a practical substitute for the boiling point of water in the calibration of resistance thermometers and other temperature-measuring instruments, states the *Technical News Bulletin* of the National Bureau of Standards, U.S.A. The acid, specially purified and sealed in an evacuated glass cell, freezes at 122·361° C. The observed freezing temperature is constant and reproducible to 0·001° C. This is a somewhat more exact reproduction of temperature than can be realised by observing the boiling temperature of water, except when the "steam point" is measured with the most refined apparatus. The greatest difficulty with an exact observation of the steam point arises from the necessity of measuring the barometric pressure very accurately. Freezing temperatures observed in evacuated cells are not affected by variations in barometric pressure, hence the new fixed point has the great advantage of requiring no barometric measurements whatever.

One of the cells used in the experimental development of the new fixed point was recently lent to a manufacturer of thermometers to determine its usefulness in the actual control of the temperature scale which such manufacturers must maintain. The manufacturer reports that he finds it highly satisfactory and intends henceforth to use it in place of the steam point.

Carnivorous Diet—and Health

How easily the delicately poised balance of an exclusively or predominantly carnivorous diet can be upset is shown by the data given in a leading article in the *B.M.J.* (August 14, 1943). The diet of the Eskimos of Northern Greenland, entirely carnivorous, consists of the flesh, glandular organs and often entrails, usually eaten raw, of Arctic mammals, birds, and fish. Their life of great physical activity, in which privations and extraordinary feats of strength and endurance are taken as a matter of course, testifies to the adequacy of this diet, and medical evidence (Thomas, *J. Amer. med. Ass.*, 1927, **88**, 1559) has demonstrated the absence of scurvy and rickets and no increased tendency to vascular and renal disease. The Labrador Eskimos, who have more dealings with whites, have largely abandoned their primitive methods of existence: dried potatoes, flour, tinned goods, cereals, and cereal products form a considerable part of their diet. Their meat is cooked and, though Labrador is not truly Arctic, vegetables cannot be grown. As a result, scurvy, rickets and a combination of the two are universal and severe (*loc. cit.*).

Information has recently come to hand about the health and food habits of another primitive northern race, the Lapps. These people now number about 30,000. They are found in Norway, Sweden, Finland and Russia, and are chiefly engaged in reindeer raising. A large proportion of the Swedish Lapps have retained the old nomadic habits. These Lapps were originally mainly carnivorous, and reindeer flesh was the chief constituent of their diet. Their meat was eaten boiled; liver, heart, kidneys, and bone marrow were boiled for a very short time; blood was usually consumed raw. Reindeer milk was freely taken. Birds, birds' eggs, and fish were also eaten. The bark of young green pines, fresh shoots of spruce and pine, and various herbs, roots and berries were eaten, and birch sap was drunk in the spring. The fare has now changed a good deal. Ekvall (*Acta. med. scand.*, 1940, **105**, 329) reports that some 50 per cent. of the Swedish Lapps children have rickets, and he noticed after-effects of rickets in some adults. He observed no cases of manifest scurvy, but many indications of the latent disease. Severe caries is common in young adults, but old Lapps have better teeth, and the Lapps are unanimous in their opinion that caries has increased of late. These primitive people can live off the land in health or vigour, but their diet does not easily lend itself to dilution with the energy foods of civilised man.

Sugars in Vegetables

Their investigations on sugars in vegetables and their rôle as food were the subject of a paper by E. Whitman Rice and Louis Lang read at a meeting of the Division of Sugar Chemistry and Technology of the American Chemical Society.

Having an acquaintance with the history of the commercial extraction of sugar from beets has aroused questions which have led to an investigation of the sugar content of some of our common vegetables and its use as food.

The literature does not generally distinguish between the sugars present but shows that the total can vary between 50 and 75 per cent. of the water-soluble solids in all of our leafy and root vegetables except those very high in starch.

Large-scale experiments with onion and cabbage indicated that the water-insoluble residue of the disintegrated vegetable was approximately 25 per cent. of the total solids and that the sugars composed 53 to 63 per cent. of the soluble solids.

A preliminary experiment with fresh carrots showed that 50 per cent. of the total solids were lost when the carrot was subjected to the common steps of pre-cooking (blanching) before dehydrating and reconstituting before the final cooking. Losses in cooking will be additional to those mentioned. Further experiments seem to indicate that the losses of valuable food components of vegetables in certain methods of processing warrant a re-evaluation of some products. This is especially true during the present food shortage.

The Cabbage

The cabbage will be such a scarce article of food this autumn owing to crop failures that the Ministry of Food has considered the diversion to the kitchen of crops normally going to feed livestock. The tale of the cabbage where our own country is concerned is titillating history—particularly now, when of Lewis Carroll's "cabbages and kings", many kings have fallen but the cabbage goes on. Back in the fifteenth century besides "parsenepys", "turnepez", "karettes" and "betes,", English gardens had their "caboches" or "caboges" as well as "coleworts"—a name applied to wild and cultivated members of the cabbage or *Brassica* family. A sumptuous dinner of the Brewers Company included then "cabboges to the potage". Piers Plowman's cole plants were probably cabbages. Gerard's Herball also referred to this English vegetable cultivated long before Sir Anthony Ashley of Wimborne was honoured by a statue with a cabbage at his feet. Arthur Young was its champion in the 1770's, encouraging cultivation as a field crop. But how English cooking ruined this vegetable by the time it appeared on the table! A damp stodgy mass boiled until the smell of cabbage permeated our inns and boarding-houses and ruined our reputation throughout Europe. "They have only three vegetables and two of them are cabbage," was the cryptic comment before the vitamin barrage opened on the kitchen front!

Cake Studies

Using the improved form of compressimeter, designed by Dr. J. C. Baker, P. P. Noznick and W. F. Geddes have studied the process of cake compressibility measurements at various stresses and the effects on staling, formula variations and mixing procedures on the compressibility of sponge and yellow loaf cakes (*Cereal Chemistry*, xx, 4, 463).

The compressibility of sponge cake decreased as the flour content was increased. The compressibility of yellow loaf cakes increased progressively as the sugar in the formula was increased from 75-125 per cent. of the sugar employed in the reference formula. More compressible cakes were obtained when the batters were mixed by the creaming method, and the changes in compressibility with variations in sugar content were greater when the batters were mixed by the creaming method rather than by the single-stage method.

Variations of 75-125 per cent. of the shortening employed in the reference yellow loaf cake formula were without significant effect upon cake compressibility when the batters were mixed by the single-stage method. The creaming procedure gave higher compressions for corresponding formulæ and there was a slight decrease in cake compressibility when the shortening was increased above that specified in the reference formula.

Staling of sponge cake as measured by changes in compressibility occurred more rapidly than that of yellow loaf cake.

Stress/strain ratios for the various stresses showed that the compressibility of sponge cake and yellow loaf cakes prepared by the creaming method tested 24 hours after baking obeyed Hooke's law. With the less compressible yellow loaf cakes obtained in the formula variation and staling studies, there was an increasing departure from Hooke's law as the compressibility decreased. Moduli of compressibility of sponge and yellow loaf cakes (creaming method) made by the reference formula and tested 24 hours after baking were $0{\cdot}156 \times 10^4$ and $9{\cdot}06 \times 10^4$ respectively, indicating that the sponge cake was 58 times more compressible than the yellow loaf cake.

Relatively large errors are involved in compressibility measurements. These include the variance due to difference between (1) measurements on individual sections cut from a single cake, (2) cakes baked from a single mix, (3) cakes made from different batters baked on different days, and (4) the interaction of main effects (formula variations and staling times) with days or batters. The magnitudes and significance of these sources of error were determined.

Increased precision is obtained by making the measurements at the maximum stresses at which compression values may be read with the instrument.

Geographico-Legal Note

The humorous journals having long since exhausted jokes about Welsh place names, we are obliged seriously to report that a farmer named Jones, living at Llanfairpwllgwyngyllgogerychwyrndrobwllllantysiliogogogoch, has been fined £25 for not harvesting a crop of potatoes, although we must confess that if he had lived at Wye or Usk or Ash we might not have recorded his naughty deed.

We once met a man on a steamer in the Mediterranean who told us that he was bound for Alicante. On being asked why, he said it was because he liked the name. It occurs to us that there may be more people than we imagine who are "charmed with the foolish whisperings of a name", as Abraham Cowley put it. When peace comes and travel agencies get busy again, they might find it worth while to explore the possibilities of the village as an exhibit for overseas visitors. We ourselves confess to a feeling that it cannot be an ordinary place and of a vague desire to see it, even if only to tell our grandchildren, in days to come, that we had been there. But if Mr. Jones had performed his normal cultural operations we should not have embarked on this discussion on post-war British tourist trade.

Fluorescence Analysis in the Food Industry

PART I

From the point of view of economy of time and material, fluorescence analysis is one of the most spectacular among the methods used in the examination of foods. Unfortunately some early workers made such exaggerated claims for the method as to discredit it, but in the last twenty years, about three thousand research papers testify to the varied industrial applications of this technique. This is the first of a series of articles surveying the subject.

J. A. RADLEY, M.Sc., F.I.C.

LIKE any other analytical tool, fluorescence does not, except in rare cases, give the whole story. It is, however, one of the most powerful auxiliary weapons in the armoury of the chemist, and gives information impossible to obtain by other physical or chemical methods. Its results, taken in conjunction with those of other physical and chemical tests, give a much more complete picture of the nature and method of processing of a substance than when the technique is omitted. It must be stressed, however, that if the results of chemical and fluorescence tests are contradictory, the latter should be disregarded, as sometimes the presence of minute amounts of impurities may profoundly affect the results in an unknown direction. This great sensitivity is both the strength and weakness of the method. Minute amounts of known impurities, giving a known effect, are readily detected; conversely, the same amounts of unknown impurities exerting an unknown influence on the results may cause confusion if reliance is placed solely on the fluorescence method. If these points are kept well in mind the value of fluorescence analysis, for rapid control of processes and for analysis and testing is very great. In many cases the " laboratory can be taken to the job " as there are a number of portable ultra-violet lamps on the market.

Fluorescence analysis depends on the fact that many substances emit visible light when irradiated with the invisible ultra-violet light. Thus a milk powder shines with a yellow light (fluorescence) when placed under one of these lamps, while casein would give a bluish fluorescence. If, however, the milk powder has been made by roller drying, its fluorescence will be very similar to, but brighter than, that of the casein as the method of processing affects the fluorescence. By a simple chemical reaction the fluorescence of the two powders can be altered in opposite directions. Thus the presence of a substance may be confirmed by its characteristic fluorescence, information as to its processing history can be obtained and, by means of a simple chemical reaction, the fluorescence can be characteristically altered so that the test takes on the nature of a chemical test rendered more sensitive and selective by the use of ultra-violet light. Many fluorescence tests are parallel in behaviour to the well-known " spot-tests ", a development or disappearance of fluorescence occurring upon the addition of a reagent, and in many cases these " fluorescence spot tests " have a greater degree of sensitivity. These tests are assuming, and will assume, greater importance as the field is extended as they combine the specificity of chemical tests with the delicacy of the fluorescence test.

Fluorescence testing is quantitative as well as qualitative, and, by the use of modified colour comparators, estimations of minute quantities of certain compounds —*e.g.*, riboflavin metallic impurities, etc.—are readily and accurately carried out. Valuable help is given by the use of the fluorescence method in the volumetric analysis of coloured, turbid or cloudy liquids. Thus, used with discrimination and intelligence and with a full knowledge of the possibilities and technique of the method, a powerful aid to the food chemist is available.

Apparatus

One of the earliest sources of ultra-violet light was the sun, and even to-day some workers use this for certain approximate tests. To carry out a test using this source, a box is fitted with the special light filter at the top, and the substance to be examined placed in the box underneath the filter and viewed through an eyepiece in the side of the box while sunlight or daylight falls on the filter. This transmits the ultra-violet light from the sky and the fluorescence of the substance is readily observed. This piece of simple apparatus can also be used with a strong electric light or preferably with an overrun electric bulb, such as a photoflood bulb. Naturally this apparatus is narrowly limited in scope, as the substance cannot be manipulated during the examination and the fluorescence is weak, but for a few purposes it has its uses.

The filter mentioned above is an important feature of fluorescence analysis, for every source of ultra-violet light also emits visible light, which is invariably so much stronger than the fluorescence of the substance being examined that it will " swamp " it. Thus it becomes necessary to interpose between the source of ultra-violet light and the substance being examined, a filter (preferably of a special glass) which will cut out the visible light from the lamp and yet pass the ultra-violet radiation. Further sources of ultra-violet radiations are the various lamps burning mixtures of certain gases and chemicals and the electric arc lamps. These are inconvenient in use and need not be described. The most important source is the modern " electric discharge tube ". These tubes are powerful sources of

ultra-violet light, clean, convenient to handle, cheap to run and in many cases are completely mobile.

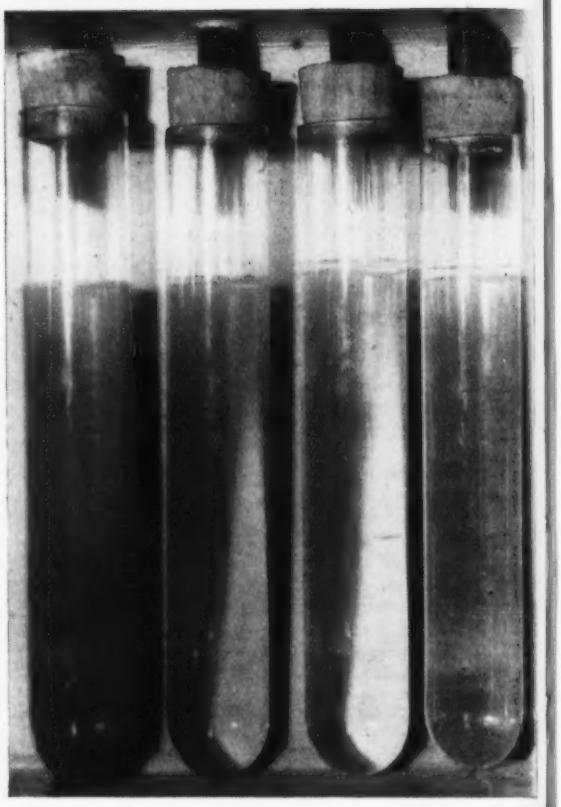
Of these the Hanovia Universal Fluorescence lamp, the Osira bulb of the G.E.C., the Mercra bulb of the B.T.H., and the Vi-Tan lamp of the Thermal Syndicate, Ltd., are representative of the useful, portable lamps on the market. They all can be supplied for A.C. or D.C. circuits running on a range of voltages. In each case the lamp has the special ultra-violet filter embodied in the design. Such lamps can be used as fixtures in the laboratory or can be carried on to the plant and plugged into the point nearest to the process it is desired to control. Essentially, they consist of a quartz tube containing mercury vapour at a low pressure, through which the electric discharge takes place on switching on the lamp. The light from this quartz burner, which is rich in ultra-violet light, passes through a "black glass" filter, described above, in the case of the Hanovia and Vi-Tan lamps, or, in the case of the bulb lamps, the whole tube is enclosed in an outer bulb made of this special glass. Thus the radiation coming from these lamps is practically all ultra-violet light with a little, visible, purple light. Each lamp is also fitted with the external electrical apparatus necessary to run the lamp when the supply lead is plugged into the lighting circuit.

The Technique of Fluorescence Analysis

The full technique of fluorescence analysis has been described by the author[1] elsewhere, and is too extensive to deal with in any detail here. However, the salient points can be set out in a brief manner in order to show the possibilities and extent of the method.

Substances may be examined in the massive state and significant points about their fluorescence noted. For example, the amount of cartilage or sinew in minced meat or sausage meat is shown by the number and size of bluish fluorescing particles present; the marked fluorescence of fish due to the commencement of bacterial decomposition; or the spread of a blue fluorescence replacing the normal yellow fluorescence at the bottom of a bottle or tube of milk showing the growth of anaerobic bacteria, are really noted. If further information is required about a substance which can be broken or powdered, it can be fractured and the fluorescence of the fresh face compared with that of the old surface to gain information on the effect of exposure to light and air on the material. Substances which readily oxidise in air or are readily affected by moisture are particularly amenable to this treatment. By powdering the substance and blowing the powder on to filter papers wetted with acid, water and alkali and examining under the lamp, information is obtained on the nature of the substance. For example, the fluorescence of salicylic acid would be little or nil on the papers damped with acid or water, but a brilliant blue fluorescence will be shown by the sample on the alkali-damped paper.

These reactions may be carried out in aqueous or aqueous/alcoholic solutions, and in the case of certain preservatives which are derivatives of beta-naphthol, the derivative is hydrolysed with acid and on making



Effect of concentration of solutions on fluorescence. Appearance in daylight of solutions and apparatus for judging concentration.

Fluorescence photograph showing progressive penetration of ultra-violet light with decreasing concentration.

the solution alkaline the characteristic and strong fluorescence due to beta-naphthol is readily seen.

Receptacles for Samples

Liquids may be examined in tubes or in porcelain evaporating dishes. The tubes may be of glass which should be non-fluorescent to avoid interference with the fluorescence of the substance being examined. If a liquid is suspected to be a solution a piece of cardboard with a small hole in it, fitted with a short piece of blackened glass tube, is placed over the test tube with the piece of blackened tube inside and the hole placed vertically beneath the lamp. In this way a narrow parallel beam of rays from the lamp falls on the surface of the liquid, observations on which are then made. Concentrated solutions show a bright fluorescence at the meniscus only, and on dilution the ultra-violet light can penetrate more and more, and hence the fluorescence is shown at progressively greater depths in the liquid with increase in dilution. The reason for this is that ultra-violet light must be absorbed by the fluorescing substance before the latter can fluoresce, and if the concentration is high all the ultra-violet light is absorbed in the first layer, which fluoresces strongly, and none gets through to the body of the tube. The lower the concentration the further the ultra-violet light can penetrate before it is completely absorbed. This method gives a good idea of the concentration of certain preserving agents, and of certain flavouring agents when compared against standards of known strength made up from these substances.

Examination of Samples in Thin Layers

Thin layers of liquid sometimes yield useful information under the ultra-violet lamp, and may be obtained by allowing a drop of the liquid to run down a glass plate or by enclosing a drop between two microscope slides. This method has proved of value for cod liver and olive oils, and could doubtlessly be applied to other oils. Mineral oil or lubricating oils have a very powerful blue fluorescence, which is perceptible in dilutions of 200,000 to 500,000. Thus the deliberate additions of these oils to fish or animal oils is easily and instantly detected, and, of course, the same applies if the oil is present as a contaminant. The author has detected the addition of mineral oil to whale oil, seal oil and arachis oils within a few minutes of receiving the samples. In two cases, subsequently confirmed by chemical analysis, the amounts were so appreciable as to indicate deliberate adulteration, but in another case the fluorescence was but moderate, and was undoubtedly due to accidental contamination, for so powerful is the fluorescence of mineral oils in general that the lamp will reveal traces not readily detectable by chemical analysis.

Capillary Analysis

Another method of examining liquids is by capillary analysis, which can be made semi-quantitative and is valuable with mixtures. Briefly, a strip of bibulous paper, cut with its length in the " wire direction " of the paper, is hung with its lower end dipping about half an inch in the liquid or solution under examination. The set-up is left for 24 or 36 hours, or until equilibrium is reached, in a draught-free cabinet, after which it is examined under the lamp. The liquid rises up the strip, drawn by capillary attraction, and if several substances are present they are deposited in zones at different heights up the strip. The height of the zone or band, its width and the colour and intensity of its fluorescence are characteristic of the substance causing it when in solution of that concentration and for that set of conditions. Thus, with coloured flavouring extracts, the components are separated so that the dyestuff present is in one band, if a single dyestuff has been used, or in several if a mixture has been employed, whilst the flavouring constituents each form zones of their own. This method has been widely used in pharmaceutical work for the examination of tinctures and extracts, and it is applicable to a number of problems in the food industry. To make the method semi-quantitative the distance from the end of the strip to the nearer and further edge of each base is measured, and these distances plotted against the intensity of fluorescence of the zones as given by a photometer or other device for measuring intensity of light. A number of problems in chromatographic analysis are also amenable to the use of the fluorescence technique.

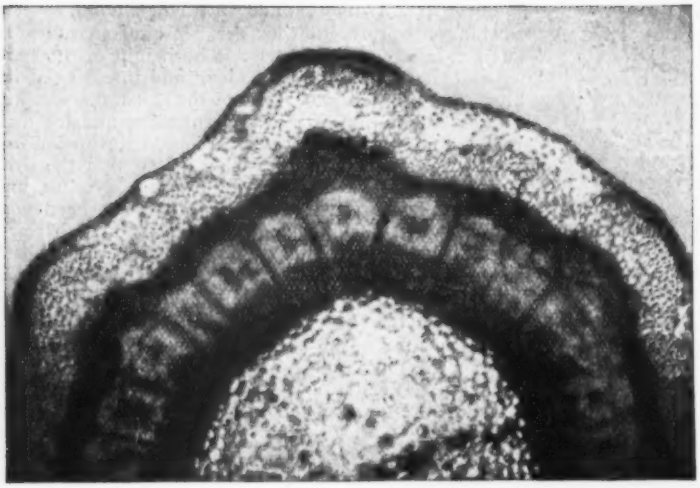
Description of Fluorescence Colours

Much of the difficulty of assessing the value of fluorescence testing lies in assigning descriptions to the fluorescence colours observed. Several workers have used instruments to reduce the taking of observations to an objective level. These instruments express the results of an observation in terms of either the amount of the three primary colours present and the luminosity or in terms of wavelength and intensity. The results of one worker are thus strictly comparable with the results of another, and obviate the use of such expressions as " a very pale luminous yellow ", " a yellowish white ", " a white with a yellow tinge ", " white with yellow shadows ", and other loose expressions designed to describe the same colour.

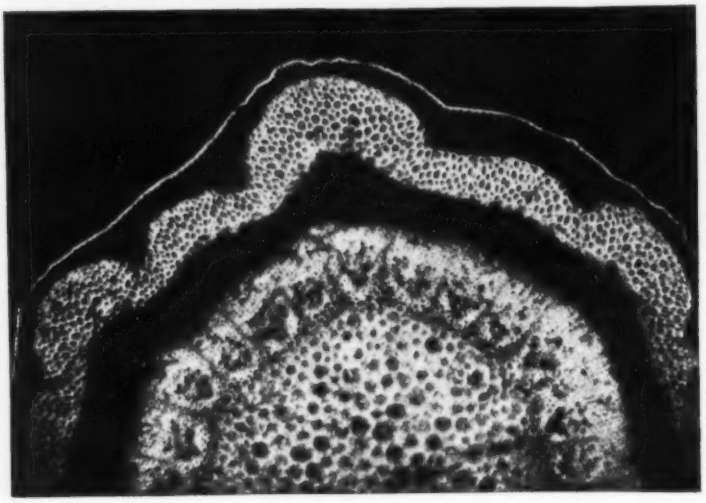
Use of Colorimeters

The Donaldson and the Guild Colorimeters express fluorescence colours in a very convenient form, making it easy to compare the results of two workers who have used this method. The earliest method of this type was the rough approximations described by Lunden, who examined the fluorescence of sugars through colour filters. The result of one such examination might be expressed as " green ", bright ; " red ", moderately bright ; " blue ", equal intensity to red. Compare this with the description of the same fluorescence measured by the Guild calorimeter, viz.—" red 27, green 44, blue 29 ", and it will be seen how such an instrument can give greater accuracy than colour screens and comparable and interpretable results reproducible by other workers. The description above is for the fluorescence of a certain butter. The fluorescence of margarines has been examined by this instrument by Morgan and MacLennan,[2] who showed that the amount of vitamin D present had no influence on the fluorescence, but that the presence of vitamin A appeared to be closely connected with, but not proportionately related to, the fluorescence colour.

A number of workers have used the nephelometer to examine the fluorescence of vinegars,[3-5] while others have used the step photometer to examine the fluorescence of oils.[6-7]



Photomicrograph in ordinary light. Orthochromatic Plate; U.V. protective film 1·2 mm.; exposure 60 seconds.



Fluorescence photomicrograph showing structure in more detail. Carbon arc, 6 amps., as U.V. source; orthochromatic plate; U.V. protective filter 1·2 mm.; exposure 4 minutes. (*Courtesy of Messrs. E. Leitz.*)

Fluorescence Microscopy of Blackberry (Rubus fructicosus).

Fluorescence Microscopy

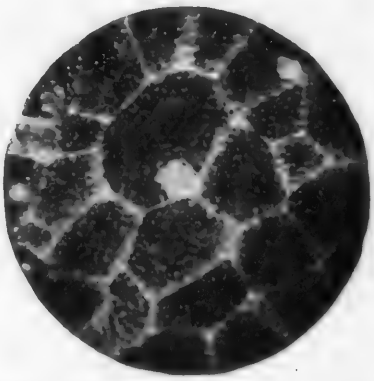
To those who deal with peppers, spices, [8, 9, 10] flours, cereals of various types,[11-14] or plant materials of a diverse character, fluorescence microscopy will be of interest. Ordinary microscopy gives variable information, but by a combination of the fluorescence lamp and the microscope the scope of both instruments is greatly increased. An ordinary microscope can be used with the usual cover slips and glass slides. The examination may be carried out in the normal manner or dark field illumination may be employed, in which case the substance is self-luminous against a dark background, and every fissure or crack and variously fluorescing parts of the object appear brilliantly contrasted. To observe the fluorescence on the surface of the object a Lieberkuhn mirror with a magnification of 160°[15] or can adaptation of the Leitz "Ultropak" may be used.[16] If transmitted light is used the residue of ultra-violet light passing through the optical system of the microscope is preferably filtered out by a suitable Kodak or an Ilford screen, cut and mounted in a short piece of paper or cardboard tubing and fitted over the eyepiece of the microscope.

Apart from the extra information given by a "straight" examination thus obtained, additional information is given by the use of the technique of "*secondary fluorescence*". Many substances may show little or no fluorescence, but on treatment with a fluorescent stain they show a bright fluorescence which may differ entirely from that of the stain itself. The same stain applied to several different substances, not normally showing a fluorescence, may cause one to fluoresce red and another yellow, another orange, etc., so that, if they are all present in admixture, they are readily distinguished after, but not before, the stain is applied. This method has proved of great value in showing the distribution of cellulose, resins, oils, aleurone layers, plasma, cell nucleus, etc., in many botanical specimens.[17] The same technique has been

Section of fruit of Triticum *treated with* 0·001 *per cent. berberine sulphate and Primuline Yellow for* 5 *seconds.*

Fruit and seed membrane fluoresce vivid yellow; cell wall of aleurone layer, blue; plasma, dull yellow; cell nucleus, golden yellow; starch, invisible.

Seeds and Fruit.



Section through starchy endosperm of Zea Mays, *stained with iodine solution and Primuline Yellow.*

Cell wall fluoresces yellow green; plasma, blue; cell nucleus, white; starch, black.

(*Courtesy of Chapman and Hall Ltd.*)

applied with outstanding success to show structures in biological specimens,[18] such as cell tissue, various glands, nerve bundles, etc., and in the leather industry to follow the effect of the different processes on hides during their conversion to leather.[19] Most of the fibres used in the paper industry can be differentiated by the use of an appropriate stain followed by fluorescence microscopy.[20,21]

Secondary Fluorescence

The use of secondary fluorescence is not confined to microscopical work and many different materials similar in their appearance in daylight and under the lamp can be readily distinguished by this method. The rapid examination of sausage-skin caps for jars, to determine their composition, should be quite possible in the food industry by the use of this technique. For mounting, water can be used, or, if a viscous medium is required, a strong syrup of glucose can be substituted. The specimen is stained in the usual way, mounted and examined under the microscope, using the ultra-violet lamp as the source of illumination. The stains employed include berberine sulphate, chelidonium or rhubarb extract, Flavophosphine 4G, Rhodamine 6GD (extra), Sulphorhodamine G, Auramine OS, sodium salicylate, flavins, Primuline AS, Acronol Yellow TCS, Phosphine G, Geranine GL and Thioflavin S in concentrations ranging from about 1 in 2,000 to 1 in 200,000.[20,21]

The secondary fluorescence method may yield useful information when used for the examination of spices, as these generally show such small differences by the normal fluorescence microscopy procedure as to be of little value for rapid analytical work. For example, the husk particles of white pepper appear lighter than those from black pepper, white pepper shows white and yellow particles, black pepper brownish grey with white particles and ground corianders reddish brown particles, thus there is little to be gained by the fluorescence method. Ground pimento shows no fluorescence, mace has a golden yellow and Jamaica ginger a cream fluorescence. Nutmegs appear dull brown.

As little as two per cent. bean flour or vetch flour in wheat flour is detectable by the bluish green or orange red fluorescing particles of the two former respectively. The addition of ten per cent. soya bean flour to wheat flour is said to change the fluorescence of the latter from a bluish violet to a canary yellow.

It may be noted that it is often very useful to carry out micro-fluorescence tests by collecting a drop of the test liquid and a drop of the reagent in a capillary tube which is then examined under the microscope with ultra-violet light falling on the tube at an angle from above. The author has found that fluorescent microchemical reactions (for metallic ions) are thereby rendered more delicate.

Volumetric Analysis

A number of coloured liquids such as vinegars, wines, cordials, fruit juices and dark-coloured liquids such as effluents are not readily titrated, using ordinary indicators, unless considerably diluted. Now certain substances show a colour change in fluorescent appearance, according to whether they are dissolved in an acid, alkaline or neutral solution. In other words, the *p*H value has a predominating effect on the fluorescence of many substances in solution. Such substances can be used as fluorescent indicators in the above cases,[31,32] and only minute quantities are required; as in many cases the substance does not participate in the reaction itself, acting indirectly, two errors usually inherent in the use of indicators are eliminated.

To carry out a titration the flask or dish containing the liquid to be titrated is illuminated with a beam of ultra-violet light striking the liquid at an angle of about 30°. The burette can be smeared lightly with vaseline to render it easy to read or the fluorescent capsule designed by J. Grant floating on the surface of the liquid in the burette serves the same purpose.[33] The titrations are carried out in a darkened room, but

the highly fluorescent vaseline or fluorescent float renders the taking of burette readings quite easy as stray ultra-violet light causes them to glow and light up the burette markings.

Choice of Indicators

The choice of indicators and the wide range available have been the subject of discussion by the author and J. Grant elsewhere,[1] and the reader is referred to this for full details. It is sufficient to point out here that it is preferable to calibrate the indicator to be used in solutions containing buffers of known *p*H values before making a final choice. Acridine, umbelliferone and beta-naphthol are useful for acidimetric titrations, umbelliferone and its derivatives in particular[34, 35] being excellent for strong acids and bases down to concentrations of 0·001 N and for acetic acid and ammonia of 0·01 N strength. For *p*H values over 7, umbelliferone is preferable to beta-naphthol, and also gives useful results with coloured effluents.

Quinine is value in that it gives two end points, one at *p*H 5·8 when the fluorescence colour changes from blue to violet (for strong acids) the other at pH 9·5-10, when the fluorescence disappears completely (for weak acids). This substance has, therefore, been used in the titration of the first two stages of ionisation of phosphoric acid.[29, 30] By measuring the variations of fluorescence and plotting them against the corresponding variations in *p*H value of the solutions characteristic curves are given by a number of substances, and in certain cases at the iso-electric point there is a fluorescence minimum. This method has been used by some workers to determine the ionisation constants of the flavins.[36]

Halogen Compounds

In determinations of halogen compounds, in the presence of nitric acid the usual indicator, potassium chromate, cannot be used. However, chlorides in meat juices or other biological fluids can be titrated directly, if a 0·005 per cent. solution of dichloro-fluorescein is used as an indicator, by rapidly adding 0·025 N silver nitrate until the yellow-green fluorescence of the solution abruptly disappears.[37-40]

Rhodamine B and fluorescein have been used as fluorescent indicators in oxidimetric titration,[37-41] the former for iodometry, bromometry and titrations by potassium permanganate, while fluorescein can be used in bromometry. L. Szebelledy *et al.*[42] have examined the fluorescence of a number of indicator substances. Table 1 summarises their findings:

TABLE 1

Indicator.	*Limit of Visibility in 5 c.c. Liquid.*	*Colour Change.*	*pH Range.*	*Suitable for—*	*Interfering Substances.*
Phenol Red	6 γ	Greenish yellow to violet	6·8-8·4	Light blue or brown solutions	Certain salts
Azolitmin	25 γ	Nil to blue	7-8	Brown and yellow solutions	Nitrites
Thymol Blue	30 γ	Nil to orange to yellow	0-2·0-8·5	Weak acids in brown, yellow and blue solutions	Nitrites
Carminic Acid	50 γ	Brown to bright red	10·6		Nitrites
Rosolic Acid	30 γ	Colourless to violet	7·0-8·2	Brown, yellow and blue solutions	Nitrites
Quinic Acid	Use sat. soln.	Bright yellow to blue	4·0-5·0		

REFERENCES

[1] J. A. Radley and J. Grant, *Fluorescence Analysis in Ultra-Violet* Light, 3rd edit., Chapman and Hall, London, 1939, reprint 1943.
[2] R. S. Morgan and K. MacLennan, *Biochem. Journ.*, 1928, **22**, 1514 (Fats).
[3] P. Wels and M. Jokisch, *Arch. Physiol.*, 1928, **219**, 738 (Vinegars).
[4] P. Wels, *Pflüger's Arch.*, 1931, **228**, 672 (Vinegars).
[5] H. Wüstenfeld and H. Kreipe, *Deut. Essigindustrie*, 1928, **32**, 345 (Vinegars).
[6] W. Sproesser, *Chem. Umschau*, 1928, **35**, 325 (Fats).
[7] H. P. Kaufman, *Zeit. angew Chem.*, 1928, **41**, 1123 (Fats).
[8] A. Juillet *et al.*, *Bull. Soc. Pharm.*, 1931, **38**, 473 (Mustards).
[9] A. Juillet *et al.*, *ibid.*, 1931, **38**, 562 (Oil of mustard).
[10] E. Gründsteidl, *Zeit. Unters. Lebensm.*, 1932, **63**, 425 (Examination of spices).
[11] T. Kühlen, *Chem. Tech. Rundschau*, 1929, **44**, 602 (Fluorescence microscopy for flour examination).
[12] P. Barbade, *Ann. Falsif.*, 1931, **24**, 581 (Fluorescence microscopy for flour examination).
[13] R. Pannier, *ibid.*, 1934, **27**, 293 (Fluorescence microscopy for flour examination).
[14] P. Barbade, *ibid.*, 1932, **25**, 468 (Quality of wheat given by fluorescence).
[15] G. Kögel, *Chem. Fabrik.*, 1928 (i), 55 (Microscopy).
[16] A. H. Willoughby, *Proc. Tech. Sec. Papermakers Assoc.*, 1935, **16**, 114 (Microscopy).
[17] M. Haitinger and L. Linsbauer, *Bot. Centralblatt*, 1933, **50**, 432 (Fluorescent stains for botanical specimens).
[18] M. Haitinger and H. Hamperl, *Zeit. Mikros. Anat. Forsch.*, 1933, **33**, 193 (Fluorescent stains for biological specimens).

(*Continued on page* 374)

Hydrogenated Fats

PART I

H. R. MITCHELL, M.I.Chem.E.

IT MAY well be contended that the hydrogenation of fats, now the basis of one of the world's most important food industries, was conceived during the Franco-Prussian War, when in 1870 the French chemist Mège-Mouries secured the prize offered by Napoleon III for the most successful production of a fat which should be as appetising, nutritious and stable as butter, and Pellerin, recognising the immense possibilities of the product, bought the rights from Mège-Mouries and started manufacturing oleo-margarine.

For nearly twenty years animal fats alone were used with liquid oils, such as cottonseed, groundnut, sesame- and hazel-nut oils. Vegetable fats began to be used between 1896 and 1900, and it was about this time that the first signs of life appeared in a process which was to grow so rapidly and extensively during the next generation.

Hydrogenation, or when applied to the particular interest of food manufacture, "hardening" of oils may be defined as the process whereby the "oleine" or unsaturated components of an oil are caused to combine with hydrogen under the influence of a catalyst and so are converted into "stearine" or saturated constituents.

The classical experiments of Sabatier and Senderens gave the first indications of the advent of the process when in 1897 they were able to show that by using finely divided nickel on pumice, hydrogen could be made to combine with vapourised unsaturated organic compounds.

The birth of the process as far as this country was concerned took place in 1903 when Normann obtained a patent for the hydrogenation of oils in the liquid condition by passing a stream of hydrogen through heated oil in which a finely divided nickel catalyst was suspended.

By 1906 the so-called "nuts and milk" margarine had appeared on the market, but a new and extensive source of fatty materials was opened up to manufacturers by the introduction of the hardening process, so much so that before the outbreak of war, 1914-1918, the manufacture of margarine was already a well-established food industry.

Production of Baking Fats

Hardened oils, however, found more extensive use in the production of lard substitutes, compounds or baking fats, as they were termed. Initially these were composed of a hardened oil of suitable melting point incorporated with cottonseed or other liquid oil. Many formulæ, some quite complicated, were evolved to provide compounds for the variety of purposes required by bakers and confectioners. These were marketed under various trade names; individual speciality compounds for cake, pastry, confectionery, etc.

During recent years there has emerged, particularly in America, a class of products known as "Shortenings". This industry is comparable to the margarine industry of Europe, and just prior to the war something in the neighbourhood of 500,000 tons of vegetable oils were hydrogenated annually for this purpose.

Vegetable shortenings are in a class different from both margarine and lard substitutes and are rapidly replacing these products, particularly in the bakery trade. They are 100 per cent. fat, and, although in this respect similar to the majority of lard compounds, differ, inasmuch as while the lard substitutes are mixtures of hard fats and liquid oils compounded together mechanically, shortenings in the large majority of cases are produced by the selective hydrogenation of one oil—*e.g.*, cotton, corn or groundnut—to a specified iodine value.

Selective Hydrogenation

Selective hydrogenation serves a double purpose, the obvious one of increasing the proportion of solid fat, and what is now considered of great importance, that of increasing the resistance to rancidity, by the selective conversion of the more unsaturated linoleic acid to oleic acid before any appreciable hydrogenation of the unsaturated to saturated components takes place.

The following analyses of vegetable shortenings made entirely from cotton oil illustrate this point very well:

	Per Cent. of Glycerides of:			*Value.*
	Linoleic.	*Oleic.*	*Saturated.*	*Iodine*
Cotton oil ...	45·0	30·0	25·0	110·0
Shortening ...	14·4	56·7	28·9	73·8
,, ...	12·8	52·4	34·8	67·3
,, ...	7·0	60·9	32·1	64·6
,, ...	2·9	60·2	36·9	56·8

In India the use of hydrogenated fats has grown enormously, and there are now a number of oil-refining and hardening plants operating in widely separated territories of that country.

Ghee

Ghee is the natural butter of India, and is used almost exclusively there for all cooking purposes. It is prepared usually in a very primitive manner by souring either goats' or buffaloes' milk, which is then churned. The butter so obtained is allowed to become rancid and then heated in earthenware pots until the water has evaporated. The clarified fat is run off, and this constitutes ghee.

Real ghee became a very expensive article of food, and the best quality was difficult to obtain. In many Eastern countries, however, whole races are not permitted by reason of religious, hygienic and other grounds to eat any animal product or food of animal origin unless it has been prepared in a particular fashion. The inception and acceptance of hardened vegetable oil thus provided a plentiful and comparatively cheap substitute for natural ghee and overcame many of these difficulties in India.

Adulteration of ghee was legalised, and ghee substitution was permitted provided the product was correctly described and the presence of any fat not obtained from the milk of the cow, buffalo, goat or sheep was declared. Ghee substitutes now consist essentially of hydrogenated vegetable fats flavoured with butyric esters.

The use of edible hardened oils has thus grown tremendously, due in some measure to the high prices of butter and lard, but undoubtedly chiefly to the remarkable qualities of these hardened oils as regards taste, colour, general utility, purity and keeping power.

Europe alone after this war will require huge quantities of hardened vegetable oils in view of the immense slaughter of cattle which has taken place.

The most common oils, hardened mainly for edible purposes, are cottonseed, groundnut, soya, sunflower, coconut, palm kernel. Whale oil of the best quality is also used in large quantities mainly for the cheaper qualities of margarine.

Five Hundred Patents

During the next twenty years after Normann's patent progress was astounding. Patent followed patent in quick succession until by 1927 something like 500 had been recorded.

It is impossible within the limits of this article to cover the wide range of even the more important of these, dealing as they do with the various substances used as catalysts, supports for catalysts, means and appliances for bringing about the intimate mixing of oil, catalyst and hydrogen and methods of recovering and or revivifying spent catalysts.

One outstanding feature of many of the patents granted during the period mentioned above is the repeated reference to the importance of obtaining intimate mixing of the oil, catalyst and hydrogen. Many ingenious methods were put forward before it became generally recognised that since hydrogen is soluble to an appreciable extent all that is required in this respect is a thorough distribution of the catalyst in the oil.

Gradually the more complicated means and appliances fell out, so that to-day there remain only four classes upon which most of the processes at present in operation are based.

(*a*) Plant in which the distribution of the catalyst in the oil is obtained by mechanical agitators.
(*b*) Plant in which this is accomplished with hydrogen alone.
(*c*) Circulation of the oil and catalyst with or without (*b*).
(*d*) Plant in which the oil passes over a rigid catalyst.

The first three require a catalyst in powder form; the last, obviously a stationary—either impregnate or superficial—form of catalyst.

Thus we arrive at the point where the hydrogenation of oils now falls into two main categories: the Batch Process and the Continuous Process.

The Batch Process

This is the older, and still remains the chief process by which the hundreds of thousands of tons of edible oils are hardened, and there are two main methods differing essentially, only in the manner of catalyst preparation. These are generally described as: (*a*) Dry reduction, and (*b*) Wet reduction.

Until some six or seven years ago the "dry" reduced type of catalyst was characteristic, but to-day it has been largely superseded by the "wet" method. Nevertheless, there remain, even in the U.S.A., a number of plants operating the older method, and so it may still be considered worthy of interest. The chief reason, however, for its inclusion here is in order that the progress in the technique of oil hardening may be presented in its proper perspective.

Although very many substances, chiefly of metallic origin, have been found to function satisfactorily as catalysts, nickel has been and still remains practically the only material used in the hydrogenation of oils.

The older method uses a support or carrier for the reduced nickel. Fuller's earth and kieselguhr are the two substances used principally for this purpose, with nickel sulphate or nickel nitrate as the nickel salt and soda ash or caustic soda as the precipitant.

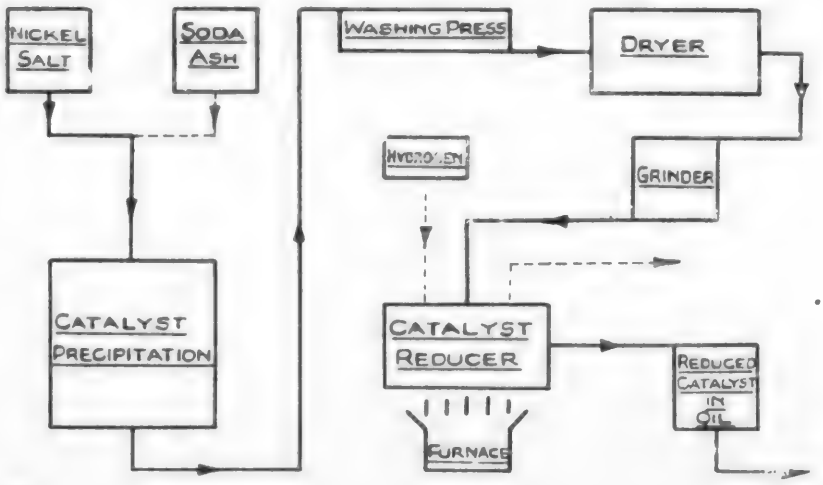


Fig. 1.—Catalyst Preparation—Dry Reduction.

Fig. 1 shows diagrammatically the course of the method to be described.

Dry Reduction

The nickel salt—*e.g.*, nickel sulphate—dissolved in hot water is run into a larger tank which is fitted with a mechanical agitator and contains the kieselguhr dispersed in hot water. Soda ash is then added and the mixture boiled gently for 30 minutes or so. The precipitated carbonate is taken up by the kieselguhr and the sodium salt remains in solution.

Cold water is added and the whole contents of the tank are pumped to a filter press. After thorough washing, the cake is removed from the press, dried and then ground. These latter operations may be carried out either together in a heated ball mill or first in an air drier and then in a grinder.

The dried powder is now ready for reduction. The reducer comprises a horizontal cylindrical vessel fitted with a conveying type of agitator whereby the material entering one end is slowly propelled therethrough against a counter-current of hydrogen gas. The cylinder is kept at a temperature of 500-600° C. by means of an external furnace. Provision is made in some installations for recovering the hydrogen, leaving the reducer by washing with caustic soda solution to remove the CO_2 released by the reduction of the carbonate; generally, however, the two gases pass out to waste. The catalyst is then in an active condition and pyrophoric, and must not come into contact with air. Means are therefore provided for discharging the reduced material after cooling it directly into oil. The oil used is of the same type and quality as that which is to be hardened, unless this is of particularly low grade, in which case an oil of superior quality is chosen in order that the activity of the catalyst shall not be destroyed before it is required to function.

Wet Reduction

The wet reduction method does not involve the use of a carrier, and compared with the operation just described is very simple. Fig. 2 shows in diagrammatic form the course of the process. It is the outcome of the discovery, made by Carleton Ellis some twenty-two years ago, that catalytic nickel could be prepared by the thermal decomposition of organic salts; for example, by heating nickel formate in an oily medium to about 250° C. (with or without hydrogen) in vacuo. The reaction is represented by the equation.

$$(HCOO)_2Ni.2H_2O = Ni + H_2 + 2CO_2 + 2H_2O$$

The catalyst reducer, which even for very large installations is comparatively small in relation to the vessels required for dry reduction, comprises a vertical cylindrical vessel fitted with a small mechanical agitator and heating equipment with automatic temperature control. Into the reducer, containing a specified quantity of neutralised bleached oil—of similar type and quality as that to be hardened—is introduced a predetermined amount of nickel formate. The formate is kept in suspension and evenly distributed in the oil by means of the agitator. Heat is then applied until thermal decomposition begins, and at this stage hydrogen gas is usually admitted. The reaction being a thermal one, hydrogen gas is not essential to the reduction, functioning only as a means of facilitating the removal of the gases which are the products of the

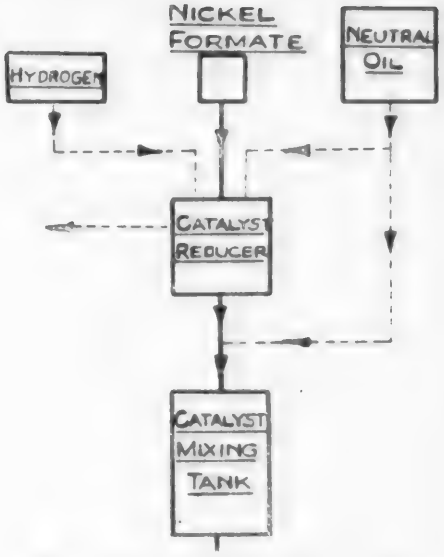


Fig. 2.—Catalyst Preparation—Wet Reduction.

reaction. All these pass out to waste. The reaction is progressive and is automatically controlled throughout, the maximum temperature being in the neighbourhood of 250° C., and the total time required 3 to 4 hours. A simple examination indicates that reduction is complete. The capacity of the reducer is such that enough catalyst, sufficient for a number of charges of the converter, can be reduced at one time. The provision of a catalyst mixing tank permits the mixing of the reduced catalyst with some of the oil to be hardened, a proportionate quantity being withdrawn therefrom for each charge to the converter.

Compared with the former method, the mechanical advantages of this simple operation are so obvious that further comment in this respect is unnecessary. It is technically, however, that the advances thus made are so much more important; those of increased *purity*, *selectivity*, *efficiency* and *uniformity*. The first three qualities are now so interconnected as to become almost one and same.

The fundamental criterion of a catalyst—and remarkable as it may seem, laid down a century ago by Faraday—is that it should be clean and pure. Oil technologists in their endeavours to produce more active catalysts for selective hydrogenation have focused their attention on this establishment of purity. Selectivity is now considered from the standpoint of partial hydrogenation with the depression of the formation of isooleic acid and efficiency as the increase in the initial activity of the catalyst, which apparently increases its latent selectivity.

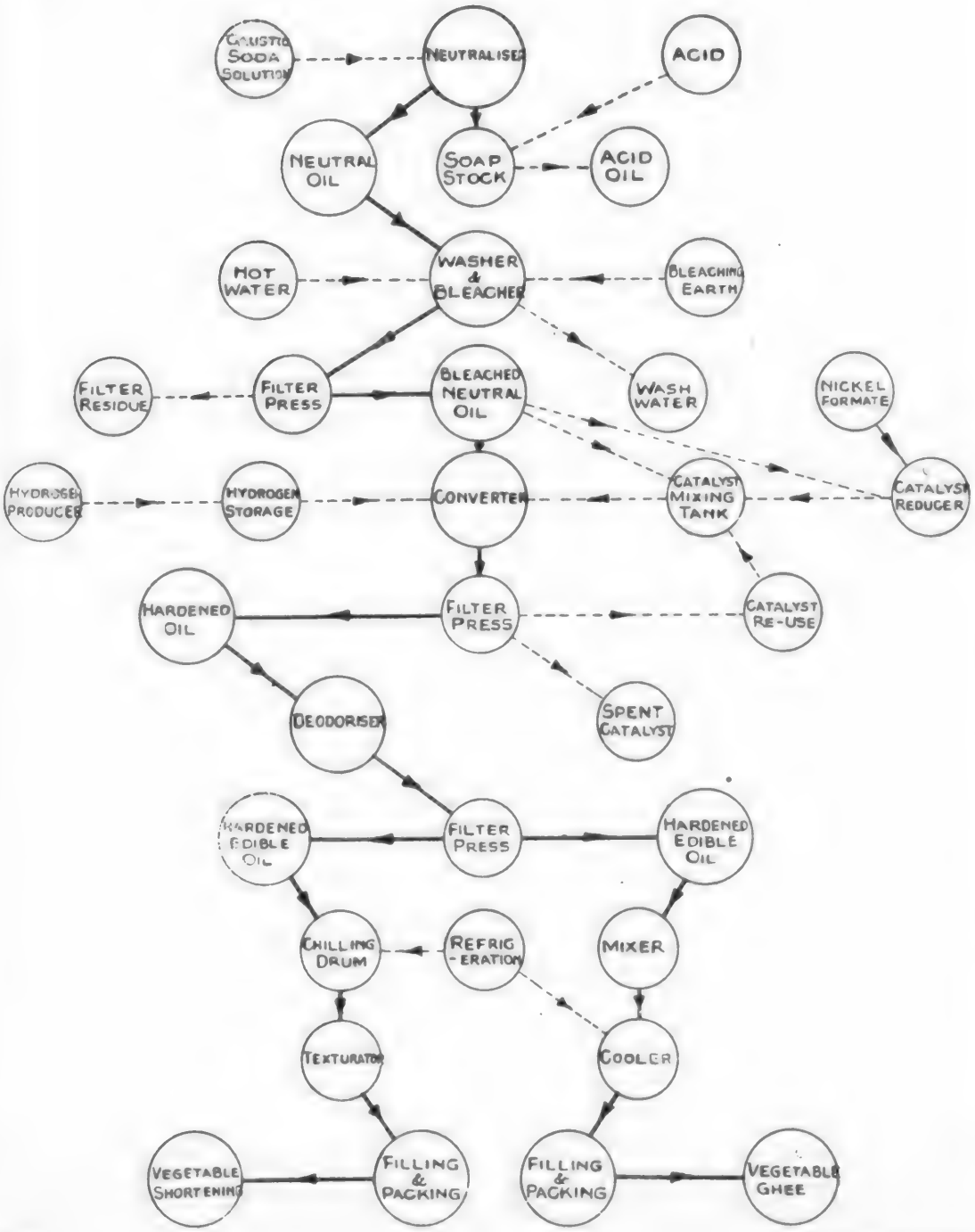
Therefore, returning to the technical consideration of the advantages of the wet reduction method, it will be as well to consider for a moment the possible sources of contamination whereby the efficiency and, as we have seen, the selectivity of the catalyst may be abrogated.

1. Impurities in the nickel salt from which the catalyst is produced—*e.g.*, arsenic, lead, phosphorus,

FLOW SHEET

HYDROGENATED VEGETABLE SHORTENING OR GHEE

Fig. 3.



sulphur and chlorine in the primary nickel salt. All these are catalyst poisons.

2. Impurities introduced during the preparation of the catalyst—*e.g.*, unconverted alkali and/or nickel salt during precipitation period; colloidal impurities from the carrier. All these are detrimental to the efficiency of the resultant catlyst.

3. Impurities in the oil to be hardened.

4. Impurities in the hydrogen gas.

This article is not concerned with the last two, (3) being a function of the refining of the oil and (4) the production of hydrogen gas. Space does not permit here a full description of the various methods and processes available whereby these stages of the complete process of producing edible hardened fats are satisfactorily accomplished. Fig. 3 shows the stages in diagrammatic form.

Suffice to say, the neutralised bleached oil to be hydrogenated must be free from albuminous matter, organic sulphur and phosphorus compounds, alkali, soap and other residual materials from the washing and bleaching operations and whatever method of neutralising is chosen the free fatty acid content of the oil, reduced to at the most 0·1 per cent. The hydrogen gas must be free from water vapour, hydrogen sulphide, carbon monoxide, all of which are catalyst poisons and inert gases, carbon dioxide and nitrogen, which, although having no effect on either the oil or the catalyst, unless removed, dilute the hydrogen and slow down the operation.

We are left, therefore, with 1 and 2. It will be readily appreciated that nickel salts to be used for catalytic reactions must be of high purity and finely ground. The advances which have been made by the principal manufacturers of these chemicals during recent years preclude any possibility of really serious contamination in supplies purchased from them when the purpose for which they are required is disclosed.

Comparison of Dry and Wet Methods

Comparison of the two methods resolves itself therefore into one of the respective possibilities of the fundamental chemical reactions involved in the manufacture of the nickel salts, to provide maximum purity of the final product. Nickel formate is prepared by dissolving either the carbonate or the hydroxide in formic acid and then crystallising out the nickel formate. Logically, the purity of the formate should be superior to that of the carbonate or hydroxide, inasmuch as a crystallised product is less likely to be contaminated with residual chemicals than is a precipitated product.

This particular function is intensified when we consider the second source of possible contamination.

With the dry method of reduction, (a) nickel sulphate or nitrate and sodium carbonate or hydroxide with their natural impurities probably greater than those of nickel formate; (*b*) the residual chemicals by the precipitation of the carbonate or hydroxide; (*c*) the impurities of the carrier. All these are difficult to remove from the precipitate which is relatively fine, and of the many methods which have been suggested and patented, those which proved effective, enhanced the cost of the resultant catalyst to an uneconomic degree.

Obviously the reduction of nickel formate offers far less risk; in fact, it almost eliminates all risk of contamination, inasmuch as the residual chemicals of the reaction are gaseous, hydrogen, carbon dioxide and water vapour.

Applying therefore the Faraday criterion in conjunction with present-day technique, the wet reduction of nickel formate, providing a catalyst of superior cleanliness and purity, establishes its improved efficiency and selectivity.

One other important advantage also emerges; a temperature of 500° C. is required to ensure satisfactory reduction by the dry method, whereas 250° C. is the maximum necessary with the wet method. Technologists have definitely established that catalysts reduced at comparatively lower temperatures have greater efficiency. Moreover, whereas the use of a furnace, besides increasing the fire hazard, does not allow accuracy of control, the wet method is safe and very easily controlled.

This enhances the formate catalyst's quality of uniformity.

Summing up: the objections to the dry reduction supported type of catalyst are:

The operation is cumbersome and messy.
It does not allow accuracy of control.
There is a definite fire hazard.
The resultant catalyst lacks purity and uniformity.
High temperature required produces a less active catalyst.

As against this, practical experience has shown that by the wet reduction nickel formate method a catalyst is produced having great activity, high selectivity and a strong resistance to catalyst poisons. Moreover, the accuracy of control and the comparatively low temperature of reduction produces a catalyst of extremely high uniformity, the use of which results in the subsequent production of hardened fat of uniform quality.

(*To be continued*)

Diet and the Common Cold

Much has been written on the common cold. As time goes on its literature paints a not-too-hopeful picture of existing curative or preventive measures. What must be taken as the latest aspects of the subject were given by the "Radio Doctor" a few days ago, from whom it was gathered that nothing much could be done about it except to go to bed for a couple of days and to keep away from infected persons.

At the beginning of the century Dr. Alexander Haig started the "Uric-Acid-Free-Diet" vogue. I have before me his little pamphlet called *The Etiology, Prevention and Treatment of the Common Cold.* In this he defines a cold as "collæmia" (that is, excess of uric acid in the blood) plus the local action of cold plus a microbe. The reason why this cold does not affect certain people in certain bracing climates or in certain conditions of training is that these people do not suffer from the collæmia on which cold and the microbe can act. It is necessary to get rid of excess of uric acid by an alkaline solvent and thereafter keep the body free from it by suitable diet. That was forty years ago, when vitamins and viruses were things of the future.

It is interesting to see that the latest of the pamphlets on colds,* while omitting the apparently

* *The Common Cold.* Food Education Society. Pp. 32. 6d.

discarded uric acid theory, ascribes to diet the greatest influence on their prevention. Written primarily for the layman, its sub-title runs, "A Few Tips for its Prevention—or Cure". In his foreword and introduction Dr. T. H. Sanderson-Wells gives an account of the frightful damage which can be done by a simple cold and warns the reader that this damage may lie hidden for years. An infected spot may blaze into galloping consumption or the ear chamber become filled with an abscess, perhaps involving its next door neighbour, the brain, or eat its way into a tiny blood vessel, thereby causing death from blood poisoning—all resulting from a long-forgotten cold!

In view of the admitted fact that a reliable cure has not yet been discovered, Dr. Sanderson-Wells stresses the all-important point of the establishment of healthy bodily conditions by means of diet, etc., in order to build up resistance to infection.

Three defences against the cold are suggested: (1) Sensible food, (2) an active skin, (3) good breathing. The first defence receives the most space—that is, eleven pages out of the total thirty-two. The necessity for a balanced diet is clearly explained, and special stress is laid upon the necessity for eating adequate quantities of salads and vegetables. Two pages are given to valuable hints on cooking vegetables, which is a thing that the average housewife and certainly the average restaurant keeper has still to learn.

The great value of raw salads, despite the Herculean efforts of the dieticians and the broadcasters, is not yet fully appreciated by the majority of people. If the average man or woman is informed of the virtues of the centre part of small hard cabbages or raw swedes or turnips he is apt either to get angry or scornful. A few years ago the chairman at a company meeting brought the house down when he compared the delights of eating his meat preparation with the hypothetical ones of eating raw carrots.

The lack of anything new in the treatment of a feverish cold is emphasised by the recommendation of old-fashioned remedies such as a mustard bath, cinnamon tea, or infusions of elderberry and peppermint leaves as a drink.

Mention is, however, made of some modern appliances such as infra-red discharge apparatus and also short-wave therapy, which is used in the treatment of many localised inflammatory conditions of the tissues. Its possible use in the treatment of the common cold on a large scale is at present being studied, and details of its technique are given in the book. Controlled experiments have shown that results vary considerably with different times of the year. The author comes to the conclusion that the methods might have application in the reduction of industrial absenteeism due to colds, but the fluctuations in their type and severity and of their response to short-wave treatment makes it difficult to assess the precise value of the method for this purpose. In an experiment carried out over a period of six months, however, the absenteeism rate among treated colds was found to be less than half of that among untreated ones.

The main thesis of the writer of this useful little book is that prevention is better and cheaper than cure, and that care in the selection and preparation of food, especially during the earlier years of life, is one of the most important factors.

Fluorescence Analysis in the Food Industry

(*Continued from page 368*)

[19] E. R. Theis and E. J. Serfass, *J. Amer., Leather Chem. Ass.*, 1938, **33**, 67.

[20] F. Noss and H. Sadler, *Pap. Fabrik.*, 1932, **30**, 541; 1933, **31**, 413 (Fluorescent stains).

[21] B. Schulzè and E. Göthel, *ibid.*, 1934, **32**, 110; Woch. Pap., 1934, No. 7 (Fluorescent stains).

[22] Haitinger *et al.*, *Zeit. wiss Mikros.*, 1933, **50**, 105 (Fluorescent stains).

[23] Haitinger *et al.*, Abderhalden's *Handbuch der biologischen Arbeitsmethoden*, 1933, **11**, (3), p. 3653 (Fluorescent stains).

[24] B Schulzè and E. Göthel, *Zellstoff u. Pap.*, 1934 **14**, 93 (Fluorescent stains, vegetable fibres).

[25] R. Jenkins, *Stain Techn.*, 1937, **12**, 167 (Fluorescent stains, animal tissues).

[26] K. L. Noack, *Verh. d. phys.-Med. Ges. zu Wurzberg, N.F.*, 1925, **50**, 47 (Fluorescent stains, botanical).

[27] S. V. Provazek, *Kleinwelt*, 1914, 6 (Fluorescent stains, botanical).

[28] O. Heimstadt, *Zeit. wiss Mikros.*, 1911, **28**, 330 (Fluorescent stains, botanical).

[29] J. Eisenbrand, *Pharm. Zeit.*, 1929, **74**, 240 (Volumetric analysis).

[30] R. Mellet and A. Bischoff, *Compt. rend.*, 1926, **182**, 1616 (Volumetric analysis).

[31] S. Malowan, *Chem. Zig.*, 1933, **57**, 76 (Titration of dark liquids).

[32] W. Holthof, *Z. anal. Chem.*, 1933, **91**, 263 (Titration of dark liquids).

[33] J. Grant, *Jour. Sci. Inst.*, 1932, **9**, 359 (Fluorescent float for titrations).

[34] R. Robl, *Ber.*, 1926, **59B**, 1725 (Umbelliferone derivatives as indicators).

[35] Y. Volmar, *Arch. Phys. Biol.*, 1928, **6**, 61 (Umbelliferone derivatives as indicators).

[36] R. Kuhn and G. Moruzzi, *Ber.*, 1934, **67B**, 888 (Fluorescence of flavins).

[11] H. Gotô, *Science Repts. Tokio Imp. University*, (Determination of halogens).

[38] C. F. M. Rose, *Biochem. Journ.*, 1936, **30**, 1140 (Titration of chlorides in biological fluids).

[39] V. Collier, *Journ. Biol. Chem.*, 1936, **115**, 239 (Titration of chlorides in biological fluids).

[40] H. R. Fleck, R. F. G. Holness and A. M. Ward, *Analyst*, 1935, **60**, 32 (Titration of chlorides in biological fluids).

[37] H. Goto, *J. Chem. Soc.*, Japan, 1938, **59**, 365, 797 1st Series, 1940, **29**, 446 (Fluorescent indicators in oxidimetry).

[42] L. Szebellédy *et al.*, *Magyar Gyog. Tars. Ert.*, 1938, **14**, 405, 387, 413, 391, 409 (Fluorescence indicators).

(*To be continued*)

BOOKS RECEIVED

Tyroglyphid Mites in Stored Products—1. A Survey of Published Information. By M. E. Solomon, M.Sc.

British Standard Code 1041: 1943. *Temperature Measurement.* British Standards Institution.

Fats and Oils in the War. By Karl Brandt.

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, September 1, page 296.

No.	*Date.* 1943.	PRICE FIXATION ORDERS
669	May 3.	Amending the Saccharin (Control and Maximum Prices) Order, 1942.
670	,, 5.	Amending the Home Grown Tomatoes (Control and Maximum Prices) Order, 1943.
684	,, 7.	Soft Fruit (Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 1138 and 1729.
686	,, 8.	Order, revoking Directions supplementary to the Carrots (1942 Crop) (Control and Prices) Order, 1942. Revokes S.R. & O. No. 391.
688	,, 8.	Cake and Flour Confectionery (Control and Maximum Prices) Order. Revokes S.R. & O. 1942 No. 2103 and 1943 No. 12.
691	,, 10.	General Licence, under the Green Vegetables (Maximum Prices) Order 1942, and the Fresh Fruit and Vegetables (Restriction on Dealings) Order, 1943.
728	,, 19.	Order, amending the Sugar Confectionery (Maximum Prices) Order, 1941.
739	,, 21.	Hay (Control and Maximum Prices) (Great Britain) Order. Revokes S.R. & O. 1942 Nos. 1191 and 1755.
740	,, 21.	Hay (Maximum Prices) (Northern Ireland) Order. Revokes S.R. & O. 1942 No. 1192 and 1943 No. 407.
773	,, 27.	Dripping (Maximum Prices) Order. Revokes S.R. & O. 1940 No. 606; 1941 No. 1889; and 1942 Nos. 584 and 1957.
784	,, 28.	General Licence, under the Saccharin (Control and Maximum Prices) Order, 1942.
785	,, 28.	Cherries (Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 1137 and 1387.
805	June 3.	Order, amending the Potatoes (1942 Crop) (Control and Prices) (No. 2) Order, 1942.
806	,, 2.	Order, amending the Milk (Maximum Prices) (England and Wales) Order, 1943.
807	,, 3.	Order, amending the Home-Grown Tomatoes (Control and Maximum Prices) Order, 1943.
818	,, 5.	Order, amending the Soft Fruit (Maximum Prices) Order, 1943.
819	,, 5.	Order, amending the Fish Cakes (Maximum Prices) Order, 1942.
820	,, 5.	Order, amending the Fish (Maximum Prices) Order, 1943.
831	,, 9.	Carrots (1943 Crop) (Control and Prices) Order.
835	June 9.	Order, amending the Potatoes (1943 Crop) (Control and Prices) Order, 1943.
847	,, 9.	Fish Sales (Charges) (No. 2) Order. Revokes S.R. & O. 1942 No. 2032.
855	,, 16.	Soya Flour (Control and Maximum Prices) Order. Revokes S.R. & O. 1942 No. 863.
857	,, 16.	Plums (Maximum Prices) Order. Revokes S.R. & O. 1942 Nos. 1380, 1709 and 1915.
865	,, 17.	Order, amending the Cereal Breakfast Foods (Control and Maximum Prices) Order, 1941.
874	,, 22.	Order, amending the Egg Products (Control and Maximum Prices) Order, 1942.
875	,, 22.	Order, amending the Green Onions (Maximum Prices) Order, 1943.
901	,, 29.	Amending the Fruit (Canning, Bottling and Freezing) (Control and Maximum Prices) Order, 1943.
902	,, 29.	Amending the Soft Fruit (Maximum Prices) Order, 1943.
933	July 2.	Amending the Meat Products and Cooked Meat (Control and Maximum Prices) Order, 1942.
934	,, 2.	Low Fat Soya Products (Control and Prices) Order.
951	,, 6.	General Licence, under the Canned Meat and Canned Soup (Control and Maximum Prices) Order, 1941.
953	,, 7.	Amending the Bread (Control and Maximum Prices) Order, 1943.
956	,, 8.	Amending the Meat (Maximum Retail Prices) Order, 1942.
962	,, 13.	Canned Fish (Maximum Prices) Order. [Reg. 55, 55AA.] Revokes S.R. & O. 1941 Nos. 1791 and 1951; 1942 Nos. 562 and 2515; and 1943 No. 459.
971	,, 14.	Home-Grown Wheat (Control and Prices) (Great Britain) Order. [Reg. 55, 55AA.] Revokes S.R. & O. 1942 Nos. 1487, 1752 and 2272; and 1943 No. 480.
972	,, 14.	Home-Grown Dredge Corn (Control and Prices) (Great Britain) Order. [Reg. 55, 55AA.] Revokes S.R. & O. 1942 No. 1488.
973	,, 14.	Home-Grown Rye (Control and Prices) (Great Britain) Order. [Reg. 55, 55AA.] Revokes S.R. & O. 1942 No. 1392.
1017	,, 21.	Home-Grown Wheat (Control and Prices) (Northern Ireland) Order. [Reg. 55, 55AA.]

No.	*Date.* 1943.	
		FEEDING STUFFS
798	June 1.	Order, amending the Feeding Stuffs (Regulation of Manufacture) Order, 1942.
811	,, 4.	General Licence.
866	,, 17.	Order, amending the Directions, February 25, 1942, given under the Feeding Stuffs (Rationing) Order, 1942.
982	July 15.	Amending the Feeding Stuffs (National Priority Pigeon Mixture) Order, 1943.
		FLOUR
625	Apr. 22.	Amending the Flour Order, 1943.
797	June 1.	Order, amending the Flour Order, 1943, and the Food (Sector Scheme) Directions, 1942.
		GENERAL
706	May 13.	Order, amending the General Licence, March 6, 1943, under the Food (Local Distribution) Order, 1943.
		LIVESTOCK
1026	July 22.	Amending the Livestock (Restriction on Slaughtering) (No. 2) Order, 1940.
1027	,, 22.	Amending the Livestock (Sales) Order, 1943.
		MANUFACTURED AND PRE-PACKED FOODS
666	May 3.	Order, prescribing Appointed Days under the Manufactured and Pre-Packed Foods (Control) Order, 1942.
856	June 16.	Order, prescribing Appointed Days under the Manufactured and Pre-packed Foods (Control) Order, 1942.
		MILK
903	June 29.	Directions, supplementary to the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942. Revokes S.R. & O. 1943 No. 664.
1009	July 19.	Amending the Milk (Scheme of Supply) Order, 1942.
1056	,, 23.	Directions, supplementary to the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942.
		OILS AND FATS
701	May 13.	Edible Oils and Fats (Control of Sales) Order. Revokes S.R. & O 1942 No. 1484.
		ONIONS
763	May 25.	Home Grown Onions (1943 Crop) (Control) Order. Revokes S.R. & O. 1942 No. 1714.
		POINTS RATIONING
892	June 25.	Order, amending the Food (Points Rationing) Order, 1943.
1006	July 22.	(No. 2) Order.
1007	,, 20.	Order. Personal Points. [Reg. 55, 55AA.
		RATIONING
891	June 25.	Order, amending the Preserves (Rationing) Order, 1942.
955	July 8.	General Licence, under the Rationing (General Provisions) Order, 1942, and the Sugar (Rationing) Order, 1942.
1001	,, 19.	General Provisions Order. [Reg. 55, 55AA.] Revokes S.R. & O. 1942 Nos. 1088, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1481, 1482, 1587, 1682, 1861, 1862, 1914, 2134, 2516 and 2528; and 1943 Nos. 6, 46 109, 173, 182, 343, 446, 507, 640, 659, 663, 700 and 892.
1002	,, 19.	Bacon (Rationing) Order.
1003	,, 19.	Fats, Cheese, Sugar and Tea (Rationing) Order.
		RESTRICTION ON DEALINGS
985	July 15.	Order, prescribing an appointed day for the purposes of the Food (Restriction on Dealings) Order, 1941. (Meat Products.)
		RETAIL DELIVERIES
1014	July 19.	Tea (Ringtons, Limited) Order.
		REVOCATIONS
954	July 7.	Order. Revokes S.R. & O. 1939 No. 1443; 1940 Nos. 223 and 1770; 1941 Nos. 353 and 1491; 1942 Nos. 435, 875 and 901/S28; and 1943 No. 362/S10.

Note.—This Order formally revokes a number of orders the need for which no longer exists.

		SOFT DRINKS
838	June 11.	The Soft Drinks Order. Revokes S.R. & O. 1942 Nos. 1336, 1337, 2118, 2133 and 2348; and 1943 No. 131.
		TRANSPORT
782	May 28.	Directions, Soft Fruit. Revokes S.R. & O. 1942 No. 1193.
864	June 17.	Order, amending the Food (Sector Scheme) Directions, August 18, 1942, under the Food Transport Order, 1941.
958	July 10.	Fresh Plums, Direction.
959	,, 10.	Plums, Directions.
980	,, 15.	Carrots, Direction (No. 3). Revokes S.R. & O. 1943 No. 370.
984	,, 15.	Order, amending the Directions, March 10, 1943. (Carrots.)
993	,, 17.	(Amendment) Direction. (Tomatoes.)
995	,, 17.	Order, amending the Directions, April 30, 1943. (Tomatoes.)
1069	,, 27.	Apples, Direction.

Colloid Chemistry in Food Manufacture

J. J. BIKERMAN

EXCEPT salt and sugar, no crystals are regularly used as food. The bulk of our foodstuffs are either typical colloids (proteins, starch) or are consumed in a colloidal state (butter, margarine). The importance of colloid chemistry for nutrition probably is much less spectacular than this statement may suggest; proteins, carbohydrates, and other colloidal products are broken down to molecularly soluble substances before they can pass into blood or lymph circulation.

The colloidal state of food affects less its food value than its consistency, which, of course, is closely related to its digestibility. Many operations of the food industry are concerned with consistency changes more than with food values as such; and in understanding and guiding these operations much assistance can be got from colloid chemistry and colloid chemists. The field is very extensive; a volume would be required to cover it,[1] and only a few examples can be considered here.

Protective Colloids in Ice Cream

Ice cream is a perfect instance of food, for which its physical state is absolutely essential; a correctly chosen mix would not even be termed ice cream if it were not frozen, and it would be rejected if the freezing had resulted in visible ice crystals. Alexander[2] apparently was the first to point out that a microscopical size of ice crystals was the essential feature of ice cream and that the size diminution was achieved by "protective colloids" present in the ice cream mix.

The rate of crystallisation and the size of resulting crystals are very generally reduced by almost any colloidal substance present in the saturated or supersaturated solution of the crystalline compound. A large part of this effect, if not all of it, is very probably due to the low rate of diffusion of colloids which "stay put" near the surface of growing crystals and retard the provisioning of the crystal substance from its solution. The magnitude of the "protection" shows wide variations according to the colloidal substance used. A semi-quantitative measure of this "protective effect" is the "gold number," which is calculated from the concentration of colloid required to prevent coagulation (or colour change) of a standard gold sol under standard conditions. It was attempted to correlate the "gold numbers" of gelatin, casein, etc., with their effect on the crystal size of ice in ice cream. The correlation was rather poor; but it must be admitted that the conditions obtaining in a coagulating gold sol are very different from those in freezing ice cream mix.

Experimental Data

There is no perfect agreement between the experimental data of different investigators as to the "protective effect" of various colloids on crystallisation of ice, but it should be remembered that the crystal size depends on the cooling conditions (rate of temperature drop, final temperature attained) at least as much as on the colloids present, and that the "protective action" of the colloids is also a function of temperature and its variation with time.

For relatively small undercoolings used in ice cream making it may be said that the crystal size is the smaller the lower is the final temperature (within the range of, say, $-20°$ C. to $0°$ C.) and the more rapidly it has been attained. A more systematic investigation of the effect of colloids on the crystal size and the rate of crystal growth of ice would be very helpful.

A quantitative determination of the rate of ice crystal growth in the presence of foreign substances has been published by Tammann and Buechner,[3] but their foreign substances did not include colloids; however, the strong retardation of crystallisation of ice caused by sugar and reported by the authors might play some part in the ice cream manufacture.

Importance of Crystal Size in Foods

There are many more instances, besides ice cream, of the importance of small crystal size in food industry. No crystals should be visible in jam; here pectin and other colloidal substances inhibit the growth of sugar crystals. Crystallisation of sugar on the surface of confectionery goods detracts from their appearance and must be avoided. These examples could have been multiplied manyfold; as Stroud Jourdan[4] puts it, "promotion or prevention of crystallisation is behind every process in which sugar is employed"; only one must suffice just to show that the importance of the fineness of crystals extends over the machinery of food industry as well as over food itself. Bright electro-plated metals are extensively used in food machinery, probably since bright surfaces are easier to clean and show up any dirt more distinctly than dull surfaces do. A brightness in electro-deposits very often is produced by addition of "brighteners" to the plating solution; these usually are colloids which reduce the crystal size of the deposits and therefore make their surfaces relatively smooth and well reflecting.

Colloids in the Sugar Industry

The retardation of crystal growth by colloids is a major factor in the sugar industry as well, but in this instance the position is reversed: the manufacturer wants to obtain well-formed and reasonably large crystals and has to eliminate colloidal "impurities" which prevent crystallisation.

The amount of these "impurities" is high; according to an estimation referring to beetroot sugar the content of organic colloids in diffusion juice is near 17 grams, in saturation juice 11 grams, and in molasses 9 grams per 100 grams of sugar.[5] However, it is hardly possible to determine definitely the total colloid content of a juice as it is difficult to decide what is and what is not a colloid. Spengler and Hirschmueller[6] attempted to count particles visible in microscope at a dark field illumination. They found 140×10^6 particles in 1 c.c. of crude juice, 50×10^6 in limed juice, 7×10^6 in first saturation juice, 3×10^6 in

crude sugar, and 10[8] in white sugar. It is seen that 137 out of every 140 particles have to be removed before sugar crystals are obtained, and 139 out of 140 before the obtained sugar is white.

The necessity for a thorough elimination of colloids is readily understood when, *e.g.*, the data for the linear rate of crystal growth of sugar as reported by Dubourg and Saunier[7] are considered. The figures in the table represent rate of growth in arbitrary units (equal to 0·08 mm. per hour) at the temperatures indicated on the top of the columns. They show that

TABLE 1.

Linear Rate of Crystal Growth.

	60° C.	70° C.	80° C.	90° C.
82 per cent. Sucrose Solution	21	20	14	5
Same +0·15 per cent. of caramel	13	15	11	4
Same +0·45 per cent. of caramel	7	10	7	2
Commercial syrup containing about 80 per cent. of sucrose and about 8 per cent. of non-sugar solids	—	2	1	—

crystal growth is accelerated when the temperature is lowered (since a lower temperature means a higher degree of supersaturation) but that small amounts of caramel can cancel any favourable effect due to a correct temperature adjustment. What that means in terms of the yield of crystal sugar in a given time can be seen from an experiment described by Bergé[8]: within a time interval when a pure supersaturated solution of sucrose deposited 33·8 grams, and an identical solution first contaminated with molasses colloids and then purified with active carbon 34·2 grams, a solution contaminated with molasses colloids and not purified yielded only 4·8 grams.

Removal of Colloids

The removal of the colloids is carried out, using some of the most typical operations of the colloid science. The formation of diffusion juice utilises the inability of colloidal substances to diffuse through membranes—*i.e.*, the property on which Th. Graham based his definition of the new class of compounds he discovered. Liming and defæcation are good examples of mutual coagulation of two colloids. Bleaching of juice by activated charcoal is a classical representative of adsorption on a highly porous solid. All these operations are so well known that their detailed discussion here would not be warranted. Instead, two other methods of sugar juice purification will be mentioned; they have not yet graduated to an industrial utilisation, are relatively little known, and involve two very interesting colloid-chemical effects.

Sugar molecules are electrically neutral and, generally speaking, remain so also in the presence of ions; therefore, if sugar juice is subjected to an electric field, sugar in it does not move. On the other hand, practically all colloidal particles which can exist as such in water are or can be charged. If an electric current is passed through the juice, they move to an electrode and leave behind a purer sugar solution. Many patents, especially in Germany, have been taken out for various developments of this process. For instance, the juice is confined between two membranes; the positively charged colloid particles precipitate on that next cathode, and the negative ones on the anodic membrane, and the remaining sugar solution crystallises more easily. A difficulty met with in this process is ordinary electrolysis which necessarily accompanies the electrophoretic elimination of colloids; electrolysis produces acid near the anode, and the acid causes a rapid hydrolysis of sucrose. The relatively high cost of the electric energy used up is another drawback of the method.

Separation by Frothing

Another device appears so far to be more promising. It utilises separation by frothing. When air bubbles rise in a liquid containing colloids like proteins or pectins a film derived from these colloids envelops every bubble and is lifted into the foam, which consequently contains relatively more of the colloidal substances than the remaining liquid does. A compromise treatment recently reviewed by Brown and Bemis[9] does not rely on this froth separation alone; the colloids of the juice are first coagulated by forming in the juice a calcium phosphate precipitate, but the "mud" produced, instead of being allowed to settle as usual, is dispersed by blowing in air and heating; the floccules of calcium phosphate with organic colloids adsorbed on them attach themselves to air bubbles and are thus transported into the scum, exactly as happens in the flotation of ores. The scum is continually carried off and the clear liquid beneath as continually withdrawn.

The more radical treatment does not involve liming; air bubbles rising in the juice carry into the froth many colloids of the juice even if they were not flocculated. This treatment has very recently been studied by O. Spengler in Berlin, but only a part of his publications are available in this country now. In U.S.A., Dole and McBain[10] took out a patent for froth clarification of sugar juice. The efficiency of the method on the laboratory scale seems to be quite satisfactory. In a paper by Ostwald and Siehr[11] the following experiment is described: 600 c.c. of filtered black-brown juice obtained from about 0·2 kg. of beetroot slices and containing 0·13 per cent. of protein was frothed for 18 minutes with carbon dioxide blown in under the pressure of 120 cm. of mercury, when the frothing practically ceased, and the remaining solution contained no noticeable quantity of protein. The formation of foam, its draining, and the separation of resulting scum from the sugar solution were carried out in a continuous manner.

A production experience reported by Meyer[12] shows that frothing improves the purity quotient of a juice by about 2·5°. But frothing alone cannot eliminate all the non-sugar components of the juice; it does not free it, for instance, from the dark colouring matter and from organic acids which still have to be dealt with by adsorption on active carbon and by liming, respectively. The scum on sugar juice is, and was for years, used as manure; there is more scum and more manure in the froth clarification of juices.

Wine and Beer

There are many kinds of food and many divisions of the food industry in which foam formation is either a nuisance or a necessary feature. Good beer is expected

to produce a bulky and stable foam, but froth on wine is condemned. In both cases the "unit of foaminess" Σ [13] can be used to express foaming capacity in an impartial measure (for beer see [14] and for wine see [15]). As in sugar manufacture, the substances stabilising foam can be removed by frothing over, thus lowering the foaming capacity of the residue; this device is used (in a crude way) in practice, and its efficiency may be illustrated by a set of figures taken from the last-mentioned paper. A wine the Σ of which was 35·3 sec. gave after one short frothing over Σ=30·1, and after two, three, four and five frothings Σ=28·3, 27·4, 21·5, and 17·5 sec., respectively. Very interesting is the dependence of the foaminess upon the nature of the gas filling the foam bubbles. Using a dynamic method, Clark and Ross[16] find that Σ of a 0·1 per cent. albumen solution is 32 to 36 sec. in air and 186 to 194 sec. in carbon dioxide. Beer shows a difference of a similar magnitude, and it appears that the lifetime of beer foam in a glass would depend on the procedure of filling the glass—*i.e.*, on whether much air is trapped in the froth or the froth is formed only by carbon dioxide bubbles rising within the beer.

"Foam as Food"

Ice cream, which offers an example of inhibition of crystal growth by colloids, is, in addition, a foam system as well: air is whipped into it in the course of its slow solidification. Apparently, an ice cream the gas phase of which is carbon dioxide, or another gas differing from air, has not yet been investigated.

Whipped cream is another instance of foam used as food. Some peculiarities of its behaviour can more easily be understood by applying the knowledge gained when studying simpler "laboratory" foams, although it must be admitted that our knowledge of the nature of foam generally is rather imperfect. However, it would not be quite wrong to say that stable foams can be produced only when the foaming system forms surface films which are either solid (protein foams) or mesomorphous (soap bubbles). If the film-forming substances are displaced from the surface of the liquid by another substance which remains liquid even in the foam, the mobility within the walls of the foam is so high that the lifetime of the foam is reduced. This effect is widely used for foam prevention; surface active liquids like octyl alcohols are well-known anti-foaming agents. The deterioration of the mechanical qualities of whipped food in the presence of oils is probably another example of this effect. The specific volume and the persistence of an egg-white foam (produced by whipping) are markedly lowered by as little as 0·1 to 0·5 gram of olive oil per 150 grams of white.[17] Milk cream which has been frozen and thawed has poor whipping qualities, apparently due to the destruction, caused by freezing, of the protective colloid membrane round fat globules; the globules run together and displace proteins from the cream surface, thus reproducing the effect of olive oil on egg-white cream.[18]

Pectin Gels

Pectin, which prevents crystallisation of sugar in jam, has also the duty of making jam more or less rigid. In the system of colloid chemistry this phenomenon comes under headings "gelation" and "gel strength". The strength of gels can be measured in many satisfactory ways, but often it would be more convenient to know its magnitude beforehand—*i.e.*, when the solution is still fluid. It was attempted to correlate the viscosity of pectin sols or of jams before, with their rigidity after, setting; the existence of an identical correlation was often believed also in connection with sols and gels of adhesives (gelatin glue, starch), but the correlation is very imperfect in both instances.

Since pectin gels contain, say, 1 per cent. or 2 per cent. of pectin, it is to be expected that the composition of the remaining 98 or 99 per cent. would influence the properties of jelly. The quantitatively preponderant component of a good jam is sugar; it contains, in addi-

TABLE 2.

PECTIN CONCENTRATIONS FOR JELLIES OF EQUAL STRENGTH.

Methoxyl Content Per Cent.	65 *Per cent. of Sugar.*			50 *Per Cent. of Sugar.*			40 *Per Cent. of Sugar.*		
1	2	3	4	5	6	7	8	9	10
9·80	0·65	3·3	2	0·94	2.9	60	1·86	2·0	90
7·78	0·65	3·0	45	0·97	2·4	120	2·42	1·9	360
7·15	0·65	2·9	20	1·00	2·1	55	2·00	1·9	360
6·00	0·65	2·7	10	0·99	2·7	15	1·32	2·7	20
5·62	0·65	2·7	5	0·70	2·7	40	0·90	2·7	60
5·45	0·65	2·1	1	0·78	2·4	20	0·78	2·4	30
4·08	0·65	2·6	2	0·73	2·7	5	0·81	2·7	15
4·60	0·65	2·5	5	0·54	2·4	20	0·54	2·4	30
4·51	0·65	2·2	1	0·63	2·6	20	0·65	2·5	20

EXPLANATION OF TABLE

Col. 1.—Methoxyl content of the apple pectin used.

Col. 2.—Percentage of pectin required when the sugar is 65 per cent.

Col. 3.—The optimum *p*H of the jelly, from the point of view of rigidity.

Col. 4.—The time of set in minutes.

Cols. 5, 6 and 7 correspond to cols. 2, 3, 4, but for a sugar content of 50 per cent.

Cols. 8, 9, and 10 are for 40 per cent. sugar.

tion to water, organic acids and mineral salts. Each one of these constituents affects the rigidity of pectin gels, and the art and magnitude of this effect depend on the other constituents. Again, almost any treatment of jam materials (such as a more or less prolonged boiling) causes a chemical, or at least physico-chemical change in them. It is not easy, therefore, to formulate rules governing the strength relations of jam; one of the rules which seem to be usually valid is that the rigidity of pectin gels depends on their hydrogen ion concentration much more than on the nature of the acid to which these H ions belong.

Behaviour of Gels

It is not easy to account for the behaviour of gels generally. Although an enormous body of experimental data on gelation and gel structure has been collected, it is as yet impossible to explain in definite terms why some sols gelate and what determines the observed degree of strength of the gels formed. In some cases it is possible to show that the gel-forming substance is present as a kind of net enmeshing the dispersion medium, and it is customary to picture gels generally as having such structure.

A thorough investigation of the effect of chief jam components on gel strength has been conducted for years by Baker and Goodwin.[19] Its experimental results are, of course, independent of any hypothetical structure, but they are easier to remember if the picture of a net of pectin fibres is used. When the strength of " knots " is high the gel rigidity depends mainly on the number of fibres in a given volume—that is, the gel strength depends on the pectin concentration more than on anything else. The " knots " are made strong by increasing the number of active hydroxy groups in the pectin molecule at the expense of inactive methoxy groups; this change is achieved simply by extracting pectin with a more concentrated acid or by letting pectinase operate for a time unchecked. Accordingly the rigidity of jellies prepared with " low methoxyl pectins " is almost independent of the sugar content of the jellies (see the last line of Table 2). On the other hand, when very much sugar is used, the viscosity is so high that it retards indentation of the jelly even if the " knots " are less strong, and the gel strength depends on the sugar content more than on the methoxyl content (see column 2 of Table 2). In the following table, shortened from the last-mentioned paper, data for jellies having equal strength are collected.

REFERENCES

[1] W. Clayton, *Colloid Aspects of Food Chemistry and Technology*, London, 1932.

[2] J. Alexander, *Kolloid-Z.*, 1909, **4**, 86.

[3] G. Tammann and A. Buechner, *Z. allg. anorg. Chem.*, 1935, **222**, 371.

[4] In J. Alexander, *Colloid Chemistry*, vol. iv., p. 163, 1932.

[5] S. E. Kharin and E. A. Moiseenko, *Colloid J. (Russ.)*, 1940, **6**, 739.

[6] O. Spengler and H. Hirschmueller, *Chem. Abs.*, 1941, **35**, 4987, 7747.

[7] J. Dubourg and R. Saunier, *Bull. Soc. Chim. France* (5), 1939, **6**, 1196.

[8] J. Bergé, *Bull. Soc. Chim. Belg.*, 1929, **38**, 31.

[9] J. M. Brown and W. A. Bemis, *Ind. Eng. Chem.*, 1942, **34**, 419.

[10] R. A. Dole and J. W. McBain, U.S.P. 2162379.

[11] Wo. Ostwald and A. Siehr, *Kolloid-Z.*, 1937, **79**, 11.

[12] W. Meyer, *Chem. Abs.*, 1941, **35**, 5375.

[13] J. J. Bikerman, *Trans. Farad. Soc.*, 1938, **34**, 634.

[14] S. Ross and G. L. Clark, Wallerstein *Lab. Commun.*, 1939, No. 6, 46.

[15] M. A. Amerine, L. P. Martini and W. De Mattei, *Ind. Eng. Chem.*, 1942, **34**, 152.

[16] G. L. Clark and S. Ross, *Ind. Eng. Chem.*, 1940, **32**, 1594.

[17] M. I. Bailey, *Ind. Eng. Chem.*, 1935, **27**, 973.

[18] C. D. Dahle, *J. of Dairy Science*, 1941, **24**, 245.

[19] G. L. Baker and M. W. Goodwin, *Delaw. Agr. Expt. Station Bull.* No. 234, 1941; *Food Ind.*, Sept., 1942, p. 53.

Fire and Food Stocks

In a recent speech Sir Samuel Joseph likened the campaign against fire wastage to an economiser whose effect was as important as the benefits accruing from laboratory research.

This remark is strikingly apposite in the case of the food industry where fire as a destructive force will negate all those constructive and progressive activities now being vigorously pursued in food research laboratories.

There seems little doubt that one of the acutest dangers exists in storage premises. Heavy deliveries of commodities are symptomatic of present-day conditions, and the tendency for these commodities to mass in vast quantities for which storage space has often to be improvised introduces a potential fire danger-factor.

The storage plan for food commodities should always take in full consideration of fire hazards. Stocks should be stored in such a manner that they are wholly accessible. If what virtually amounts to a job of demolition amongst crates and packages has to be undertaken before a small outbreak can be reached, the blaze may rapidly get out of hand, develop into a fully fledged fire and threaten the bulk supplies. A situation may arise where a fire-fighter has to scramble over the top of goods, and to ensure maximum accessibility they should not as a general rule be stacked within 3 ft. of the ceiling. This provision has a special application where sprinklers are installed, for goods rearing up to the ceiling immediately beneath the sprinkler heads will only serve to impede the dousing action and defeat the whole principle of this type of extinguishment.

Labour conditions these days do not always permit the employing of a qualified electrical maintenance man. In this case a responsible person should examine all electrical repairs and alterations which are often necessary when storage space must be commandeered in premises hitherto unused for this purpose.

It is unwise to fit naked lamps directly above stacks of readily combustible goods, unless they are enclosed in substantial glass globes; where portable hand lamps are used, see that they are fitted with wire guards and

glass shields, so that they cannot come into direct contact with combustible materials. And in the interests of fuel economy, besides fire danger, the electric supply should be invariably cut off from the main switch when a store is not in regular use.

There has been much glib talk about spontaneous heating, but whether its true dangers are appreciated is another matter. It is a certain fact that this fire hazard does jeopardise food stocks, particularly when certain oils are concerned. Spontaneous heating in this case is a process of rapid oxidation, and if the oils are in contact with textile the ideal conditions for a fire from spontaneous heating and subsequent ignition exist. Heating and ignition may also arise from fermentation, and it is therefore important to keep a close watch on stocks which are subject to rapid deterioration when kept too long. It is advisable to segregate these commodities from those less prone to this kind of fire phenomenon.

Dangers of Fats

Certain fats, such as lard and margarine, liquefy immediately a rise of temperature is marked, and should a fire break out in their vicinity they present a ready means for spreading an outbreak. The spectacle of streams of blazing fat dropping from floor to floor through stairs, lifts, pipes and ducts, etc., is not a pleasant one, and emphasises the need for storing in some parts of the premises where there is no chance of egress through the channels mentioned.

It is a well-known fact that smoking is responsible for half the fires that break out to-day. "No Smoking" notices are not sufficient. The control of smoking is a matter for conscience rather than mere written instructions.

Staff should be made to understand that there is nothing to choose between the cigarette butt and "Fire Bomb Fritz"—if anything, the cigarette is the more dangerous. A fire bomb announces its presence with a fiery flourish, but a cigarette end gets to work secretively, smouldering unnoticed before its disastrous attack develops.

The commitments of the food industry will increase rather than decrease when the shackles of oppressed Europe are freed.

Fuel Supplies and Food

COAL production—which has to meet rapidly increasing demands both at home and overseas—and the vital necessity of limiting the use of imported fuel oil to release tanker tonnage has made the position of supplies of fuel for industry and domestic consumption increasingly difficult.

However important a commodity may be, oil, electricity and gas must be used with the utmost economy if future military operations are not to be jeopardised.

Exceedingly good results in the saving of fuel have been obtained by the Fuel Economy Campaign initiated by the Ministry of Fuel and Power. Much, however, remains to be done by the general user, whether in industry or the home.

Regional Fuel Efficiency Committees are operating in each of the twelve defence regions of the country, served by panels of highly qualified engineers. These engineers, on a voluntary basis, are carrying out inspections of works and factories, giving advice on fuel efficiency and economy.

In addition, many industries—amongst them those of the Food Group such as sugar, brewing, milk, sugar confectionery, cake and biscuits, canning, cold storage, animal by-products and coffee—have Industrial Fuel Efficiency Committees working in conjunction with the Regional Committees. From these committees advice and assistance in all matters relating to the saving of fuel may be readily obtained. Full use should be made of their services for the inspection of plant with a view to effecting economies.

Firms should adopt such obvious measures as the appointment of fuel officers and fuel watchers, whose business it is to see that wastage of fuel is avoided and existing plant maintained and operated in the most economical manner.

Technical aspects of fuel economy are dealt with fully in literature obtainable from the Ministry of Fuel and Power. Instruction courses for stokers and others who use fuel are also available.

Washed and screened coals, and particularly large coal, are urgently required for plants which, for technical reasons, must have these high-grade qualities of fuel. This means that other users must accept types of coal to which they are not accustomed, and firms which are asked to use these classes of fuel—often more readily available in their districts—should make every effort to comply. Those firms which are not approached officially will be given valuable assistance by introducing inferior grades of coal or coke wherever possible.

Imported Fuel Oil Position

The imported fuel oil position is being greatly relieved by the substitution of creosote pitch where practicable. To this end many conversions of plant have already been carried out. Other fuel-oil users selected for conversion will be notified either by the Ministry of Fuel and Power direct or through the Ministry of Food.

Every assistance is given so far as circumstances permit by the Ministry of Fuel and Power, and in the case of food firms by the Fuel Supplies Branch, Ministry of Food, for release of materials required in connection with fuel economy measures and for approved conversions to the use of alternative fuels.

Many food producers have already shown what can be done to reduce fuel consumption. In some instances a saving of as much as 30 per cent. has been effected. If others follow this example, a most valuable contribution to the country's war effort will be made without the imposition of restrictions which would immediately affect the whole population through its food supplies.—*Ministry of Food.*

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Problems of Freed Europe

At an open conference under the auspices of the Association of Scientific Workers on October 2 several speakers discussed the food problems to be faced in Europe both present and future.

Medical scientists and nutrition experts took part; on the platform were representatives of the British Medical Association, the Council of British Societies for Relief Abroad, the Nutrition Society, the London Trades Council and the League of Nations Union.

The following resolution, moved by Dr. S. C. Dyke, President of the European Association of Clinical Pathologists, was carried by acclamation :

> This Conference urges upon the Government that there be no relaxation of rationing until the needs of occupied Europe have been supplied, and that, as an essential preliminary, a wide campaign of education be undertaken to explain to the public the necessity for such a measure.

The proceedings of the Conference were recorded by the B.B.C., and the following is part of the message sent for relay to the peoples of occupied Europe :

"The liberation of occupied Europe both in the East and in the South has now begun. This Conference of scientists of the United Nations today has discussed in detail the sort of relief that is needed in the various occupied countries and has examined the technical measures that have been and must be taken to give effective help. Medical, veterinary and agricultural scientists will be called upon to participate in the objective solution of the problem. This Conference pledges itself that no effort shall be spared by scientists to ensure that relief follows immediately after the armies of liberation. Through this Conference British scientists have realised the magnitude of the problem of bringing relief to the countries of Europe. We feel confident that the British people, who have made sacrifices during the war in order to defeat Fascism, will be prepared to accept further sacrifices in order to bring food and health to the people of Europe so that we may co-operate to build a happier society."

Professor J. R. Marrack said that relief, not charity, was required. The problems were not confined to food, the main object being to set people on their feet again, which implied need for machinery for restarting railways and factories and the supply of raw materials. This may be the beginning of an internationally planned consumers' economy and lead up to Hot Springs plans. After the last war supplies were inadequate, and they should be based on physiological needs which are now better understood now we have the findings of the Leith Ross Committee.

There is need for administrative power for the control of shipping and internal transport. Professor Marrack was of the opinion that the U.N.R.R.A. is likely to be more effective than the League of Nations Covenant. In the handling of problems of relief—food, raw materials, machinery, livestock and seeds, medical aid and restoration of displaced people—the findings of the Leith Ross Committee are blue prints of internationally controlled consumers' economy and lead up to freedom from want.

Dr. A. Marteau pointed out that the most urgent problem to be faced when Belgium is free is the problem of food. In October, 1940, after three months of Nazi occupation, the situation was worse than at the end of 1917, after three years of war. In a few months all stocks and all reserves of food and clothing had been cleared.

The work of distribution of food, fodder, raw materials, medical products, etc., by the Allied or neutral countries and the choice of organisations and persons to be responsible for it are major problems—until they are resolved a rational programme is not possible. The political aspect of the problem must not be allowed to paralyse action. Belgian resistance has not given way to threats nor broken down under Hitler's oppression, nor will it be disposed to accept under any form whatever a dictatorship of corned beef and condensed milk. We have heard much of unconditional surrender. We must see now that the peoples starved by Hitler will accept only one kind of relief: *unconditional relief*.

Dealing with Czechoslovakia, Dr. V. Kruta stressed the fact that beside the problems common to most occupied countries, the Relief authorities will have to overcome the difficulties of long communication lines, and most vital supplies will have to be sent by air. One of the most urgent tasks will be to draft food supplies to people in concentration, labour and other camps, ghettos, etc., who will be threatened by starvation after the collapse of the Nazi administration. Many problems are connected with the subsequent enormous movements of populations. Control of infectious diseases, prevention of epidemics, detection and treatment of nutritional deficiencies, rehabilitation of exhausted populations, maternal and child welfare, etc., will be the immediate and difficult tasks of the medical profession and public health administration.

Speaking of Greece, Dr. A. P. Cawadias said he did not think it was any exaggeration to say that of all occupied territories Greece represents the most terrible problem and at the same time one of the finest manifestations of physical and moral endurance that a people has made for its liberty.

Greece has been submitted to a famine which has been made worse by the fact that it is far from being self-supporting from the point of view of food, being composed principally of mountains.

Continued malnutrition has resulted in an enormous increase in disease—those of the bones and joints being most common. These conditions of malnutrition constitute a challenge to medical sciences, and there is one challenge that we have not heeded—that of prevention. Dr. Cawadias was sorry that the medical profession in all parts of the world had not taken action a long time ago to bring relief to the starving people of Europe and so prevent this malnutrition and its consequences against which it will be necessary to fight for a whole generation. He was proud to say that the medical profession in Greece had done everything possible to allay the catastrophe. It is now time to respond to the challenge.

The scale of devastation in the territories temporarily occupied by the German invader in the Soviet Union was described by Professor S. A. Sarkisov. He gave examples of industrial, medical and other institutions, agricultural equipment, etc., that had been destroyed.

The speaker also dealt with the needs of people in regard to restoration of dwelling-houses, food supplies, medical aid, etc., and concluded by giving examples of measures taken by the Soviet Government and public organisations to deal with these requirements.

Flavour and Food

PART II

R. W. MONCRIEFF, B.Sc.

THE FLAVOURS of vegetables are as a rule mild. Exceptions are the onion and leek, which owe their pungency to diallyl disulphide. Some of the root crops are sweet—*e.g.*, the turnip has 7 per cent. sugar and the sugar-beet averages 16 per cent., although the original vegetable from which it has been developed contained only 2 per cent. The locust bean-pod is one-third sugar, 23 per cent. sucrose and 11 per cent. glucose.

The offensive odour of decayed or old greens is due to the presence of sulphur.

Soy is a piquant sauce made from the soya bean, and its flavouring constituents have been the subject of considerable research in Japan. Udo (*J. Agr. Chem. Soc. Japan*, **8**, 675-84, 1932, and *Chemical Abstracts*, **27**, 1059, 1933) considered that the taste of soy was due to mixtures of salts of glutamic and succinic acids and amines such as arginine, histidine, putrescine, cadaverine and choline. Akabori and Kaneko (*J. Chem. Soc. Japan*, **57**, 828-37, 1936, and *Chemical Abstracts*, **31**, 1355, 1937) showed that the characteristic flavour was due to the presence of (γ-methylmercapto) propyl alcohol $CH_3S.CH_2.CH_2.CH_2OH$. This substance itself had a disagreeable odour, but when added in small quantities (10 parts per million) to soy sauce it improved it and increased the characteristic odour. Later they showed that two other flavouring agents which contributed to the odour were (δ-methylmercapto) butanol and (γ-methylmercapto) propaldehyde.

The distinctive flavours of vegetables such as the carrot, parsnip, celery, etc., are found in their essential oils. An interesting flavour component is found in oil of cucumber—viz., nonadienal, together with the corresponding alcohol. The aldehyde has a strong odour of fresh cucumbers (Janistyn, *Seifensieder Ztg.*, **67**, 16, 25-6, 1940).

Foods of Animal Origin

The pleasant flavour of butter is largely due to small quantities of diacetyl—a yellow oil with a pungent sweetish odour. Volatile acids, particularly butyric, also contribute to the flavour. Butter fats are mainly glycerides of oleic, palmitic, stearic and myristic acids and are practically odourless. Goat's butter contains also capric, caproic and caprylic acids.

Margarine is made from many unsaturated fats of both vegetable and animal origin. The unsaturated fats are liquid at ordinary temperatures and have strong odours. Chemical saturation is effected by catalytic hydrogenation, and the saturated fats are both odourless (or nearly so) and solid at normal temperatures.

The proteins are built up by plant life and occur in small quantities in all vegetable matter such as grass. Peas and beans have much larger protein contents. When animals feed on this vegetable matter the proteins are used in body-building, but are not greatly changed. They consist of long amino-acid chains and usually have about 0·8 per cent. sulphur in them. When protein foods are fresh—*e.g.*, meat, fish and eggs—they have relatively mild odours, but if kept until decomposition starts, then the large molecules break down into smaller residues of amino-acids, amines and acids which give a high flavour to the food—*e.g.*, poultry or cheese. In fish, amines predominate; in the egg the sulphur compounds formed give rise to objectionable odours. Much protein food is preferred in a partly decomposed state, as the flavour is then better developed and probably the products are easier to digest. Cheese is ripened and a bird is hung, but no unnecessary delay is countenanced in the case of an egg.

Sweetening Agents

Sweetening agents are nearly always odourless. Sucrose is far and away the most usual sweetener, followed by glucose and by the fructose eaten in fruits. Most sweets are flavoured with odorous materials, and the combination of pleasant odour and sweet taste seems to give most satisfaction. Sugar is usually taken with tea, coffee and cocoa, each of which contributes its own aroma. Chocolate is usually flavoured with vanilla. Cakes and puddings incorporate fruits, spices and essences. From the standpoint of dietetics, too much sugar is eaten, and from that of gastronomy the same is true, for the intensely sweet taste of sugar overwhelms the more subtle flavours of many foods. In wartime, when sugar is scarce, saccharin is the usual substitute.

Spices

Some of the essential principles of the common spices are: Pepper, piperine and a volatile oil; mustard, allyl isothiocyanate; cloves, eugenol; caraway, carvone; vanilla, vanillin; cinnamon, cinnamic aldehyde; thyme, thymol; sage, borneol; peppermint, menthol, menthone.

B.P. 507257 claims that a product of similar flavour and smell to peppermint oil is given by a mixture of 50 per cent. synthetic menthol, 35 per cent. menthone, 12 per cent. menthyl acetate, 3 per cent. menthyl isovalerate.

White pepper has usually been bleached and has lost much of its original aroma. Paprika is a large-fruited variety of pepper, not so hot and pungent. Nutmegs are the kernel of the fruit of *Myristica fragrans*. Their well-known characteristic odour and hot, aromatic taste is due to a volatile oil. They are used as a carminative, but in excess have undesirable results.

There is a growing tendency to use the essential oil from a spice instead of the spice itself in confectionery. The flavouring is then more uniform and the products are brighter in appearance. The quantities of oil used are, of course, much less than the spice which would be necessary. For data on relative quantities to be used see *Food Industries Manual*, Section 4 (Flavourings).

Tobacco

The bodies which impart the aroma to tobacco do not seem to have been identified. An ethereal oil and certain resins have been extracted, but these determine only partially the aroma.

Great care is exercised in the growing and drying and fermentation to secure a mellow flavour. The plants, which grow 7 to 8 feet high, are protected from sun and rain by screens of cloth supported on poles. The tobacco must be kept free from contamination by other odours, which it readily picks up. The character and aroma is largely determined by blending. The nicotine content is usually between 1 and 3 per cent., and in good cigarette tobacco will be about 1·2 to 1·5 per cent. A high content of protein or organic acid lowers the quality. The smoke of the best tobaccos is nearly neutral. It stimulates not only the olfactory nerves, but also the common chemical sense.

In the case of snuff, various essential oils or ground orris-root or Tonquin beans may be added to flavour the tobacco.

The benzoxazoles possess a tobacco odour and the isoamyl ether of β-hydroxypropionaldehyde diethyl acetal has an odour of burnt tobacco.

Removal of Undesirable Flavours

Many foods, wines and tobacco which have agreeable flavours will readily acquire disagreeable flavours if stored in proximity to other odorous substances.

Other materials, particularly water, acquire undesirable flavours through causes beyond control. Then adsorption is frequently resorted to. The purification of water is carried out with charcoal or chalk, which adsorbs the offensive material, or the latter may be oxidised with chlorine or ozone and the odour thus removed.

An instance of odour being removed from wheat which had been partly damaged by fire and had a burnt odour was described by Marchadier and Gonjon (*Ann. fals.*, **7**, 259-60, 1914). By repeated shaking with bran the wheat was deodorised. It was separated from the bran by sieving.

U.S. Patent 2146058 (1939) describes how foods such as flour are mixed with about 0·01 per cent. of finely divided active carbon to remove tastes.

Sometimes a bitter principle may be distilled out of a substance with steam—*e.g.*, the bitter taste and burnt smell from malt extracts and worts.

Chemical action may also be used—*e.g.*, U.S. Patent 1813642 (1931) describes the removal of taste and odour from petrolatum stock material, which is used medicinally. The method adopted was to warm with fresh aluminium chloride and remove the sludge, subsequently washing and drying.

In the case of a natural product which has an objectionable odour, the latter may be masked by other strong odorants. Thus Australian Patent 20127 (1929) describes the masking of castor oil with saccharin, vanillin and oils of lemon and peppermint. Similarly, U.S. Patent 2058162 (1936) suggests the use of oils of celery and sage to improve the taste of castor or cod-liver oils. The nauseous taste of some cod-liver oils is due to the oil remaining in contact with the decomposing organic matter before extraction, and nowadays it is expressed as soon as possible to avoid this.

Metal Articles

Metal articles such as cutlery often acquire a taint. Silver exposed to various sulphur compounds such as onions, leeks and mustard acquires a "silver odour". Raub and Nan (*Mitt. Forschungsinst. Probieramt. Edelmetalle*, **7**, 51-64, 1933, and *Chemical Abstracts*, **29**, 3957, 1935) investigated this and found that with different metals the odour varied in character and intensity. Gold and platinum were also slightly tainted. Nickel-and-chromium plated brass remained odourless. Alloys of silver with tellurium and selenium also remained odourless. The odour could be removed from any of the metals by treatment with dilute hydrochloric acid or nascent hydrogen or by heating. German Patent 614352 (1935) by Raub describes a method of treating the articles with oxidising agents that do not attack the metals, such as hydrogen peroxide or neutral aqueous solutions of perborates.

Cheap Food

The publication of unorthodox views is to be encouraged if they are reasonably argued; but the matter in a little treatise* recently published is not likely to detain the critical reader long.

The scheme of the book is described on the cover flaps as follows: "The author is an authority on dietetics and his laboratory in Prague had a European reputation. Dr. Keller's teachings and research there were closely associated with the work of Max Gerson, Bircher-Benner, Ragnar Berg and others who have applied the most recent developments in cytology, histology and biophysics to the study of food and human requirements.

One of the fundamental principles of the author's methods is the health value of a low salt diet with raw vegetables, and he can quote many famous names—among them Hitler, Stalin and Dr. Salazar—who have adopted raw vegetable and low salt diets with good results."

Some "biophysical" considerations in a chapter "for scientists only" are accompanied by praise of potassium as a cure or ameliorative agent in several diseases. Here and elsewhere are extolled the virtues of the soya bean, which contains "the record content of potassium—viz., 1½ per cent."; and in April, 1940, "a food expert stated in *The Times* that the unpreparedness of soya reserves was one of the severest defeats of England in this war." Why is it, I often wonder, that the soya bean—alone among plants—has the property of exciting a semi-mystical devotion?

The author does not believe in white flour or refined sugar—the latter should be partly substituted by cane syrup. There is some confused pleading for treacle or molasses, but the author fails to mention its potash content, which would be a point in its favour if the arguments were better marshalled.

The nub of the book is "A Table of Foods in Alphabetical Order showing in a single figure the comparative value in nutritive units of potato." This has been

* *New Aspects of Cheap Food.* By Rudolph Keller (Prague), D.Sc. Bâle. London. 1943. 1s. 6d. net. Pp. 52.

drawn up with the praiseworthy intention of helping the housewife to select foods on the basis of cost per unit rather than gross cost. Thus, it is explained in the text that margarine at 5d. per lb., containing 88 per cent. of fat and yielding 226 calories per ounce, has a food value of five-ninths, or 0·55, in comparison with potatoes costing 1d. per lb. and containing 20 per cent. of carbohydrate, some protein, a trace of fat, and giving 25 calories per ounce. No figure visibly corresponding to 0·55, or its reciprocal, appears in the table, unless it be a boldly printed 1·9.

The idea of expressing food units in single values analogous to the starch equivalent of animal feeding stuffs is a good one, but it needs much more care than has been given to it here. The author admits the difficulties, and writes that his " multiplier of protein and fat percentages looks at first sight somewhat complicated." As no real evidence or calculations are set out in support of the " multiplier " or conversion factor, I suggest that the word he wanted was not *complicated*, but *arbitrary*. The possible value of the " multiplier " to the housewife has been diminished by the fact that the headings to the last two columns in the table have been mangled in the printing: a circumstance which the housewife is unlikely to note and to allow for.

In the bulk of the text the author appears to rely upon assertion and quoted authority to a degree not usual in better-class British publications on dietetics. If European reputations are thus built we need have little fear; and let us hope that the meteor flag of England, Scotland and Wales shall yet terrific burn, even to the confusion of admirably motorised divisions of Germans replete with soya preparations and the latest information about quasi-mineralic vitamins.

H. N.

Food Poisoning

Nowadays cases of food poisoning, happily not of frequent occurrence or of widespread nature, are given considerable publicity in the daily Press. This is as it should be, as it enables the man-in-the-street to understand from what articles of food poisoning might be expected and to scrutinise them more carefully.

In many cases, of course, mere examination by taste or smell will not disclose infection, and it would be well if accounts of cases of food poisoning were accompanied by some reflections on the necessity for adequate sterilisation by thorough cooking of the more risky articles of diet.

Reports of food poisoning cases demonstrate the energetic measures which are taken by those concerned to track the operative micro-organism or poison to its source—measures which usually end successfully.

Although it is of no interest to the unfortunate victim whether arsenic or *B. enteritidis* or *B. aertrycke* has caused his death, adequate investigation, nevertheless, has its repercussions in ensuring subsequent precautions which may save lives in the future.

Both to the layman and the specialist will be welcome the publication of a book* containing in readable form the fundamental facts relative to the different kinds of food poisoning.

As the author states, the selection of essential material has been difficult, the data being disseminated among numerous medical works, scientific treatises, journals and pamphlets, or recorded in Public Health Reports published during the past decade as a result of the investigations, studies and experiments by medical experts and observers in this country, the Colonies and the U.S.A.

The author has collated this material in a well-balanced way. It is devoted to the following categories of food poisoning:

> Bacterial food poisoning; Contamination of food by metals; Plants and fungi; Fish and shell-fish; Contamination of food by poisonous gases used in war. Food allergy is also included.

The author pays this tribute to the food industry: " The major portion of our food supply has been beyond criticism or suspicion. This is attributable not merely to legislation which exacts in every way higher standards for products and manufacture but to a genuine desire on the part of manufacturers, canners, and traders to place on the market clean, wholesome food."

Considering the enormous amount of perishable food handled, the surprisingly small proportion which causes illness bears witness to this contention.

A short history of food poisoning surveys the subject from a reference to Theophrastus' book on plants (B.C. 300) to Circular 2198 of the Ministry of Health (1940).

The general aim of the book is to record as completely as possible all sources of poisoning caused by food, and it is in no sense a laboratory manual. The different kinds of foods which have been the vehicle for poisons, whether of bacterial, metallic, animal or plant origin, have been enumerated and outbreaks of poisoning recorded.

A comparatively large section is devoted to botulism, rarely occurring in this country. No authentic cases were reported in Great Britain until August, 1922, when the Loch Maree outbreak caused the death of eight persons within a week after eating sandwiches made with wild duck paste. No cases have been reported since 1935.

There has been considerable attention called recently to the number of edible fungi which occur in this country and which would form a valuable addition to the diet. A useful chapter on the subject will be found in this book.

The value of this eminently readable book is very greatly enhanced by the references to the bibliography given at the end of each chapter. The author has made these as complete as possible; they are invaluable for anyone who desires to study any given aspect of the wide subject of food poisoning.

P. B. E.

* *Food Poisoning*. Its nature, history and causation. Measures for its prevention and control. By Elliot B. Dewberry, M.R.I.P.H., M.R.San.I. Pp. 187. London. 15s.

TO AUTHORS

Food Manufacture is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Food Education Society

THE newly-constituted Food Education Society has issued a manifesto, which explains its aims and opinions. The manifesto is as follows:

(1) *A sufficiency of good food should be regarded as the right of every citizen.*

Stress has been repeatedly laid on the fact that about a third of the population of Great Britain is existing on dietaries inadequate to maintain vigour of body and mind. What is needed is not only enough food but the right kind of food. The prevention of sickness, which is the first declared object of the National Health Insurance Act, would thus be possible. Twenty-five years' experience of this Act suggests that it has failed to reach its objective because it has not dealt with the root of health—Nutrition.

(2) *One of the chief services of the Government must be the provision of an ample supply of wholesome foods.*

Steps to this end cannot be taken too soon. This country has been forced to greater dependence on home-grown food, and wartime conditions provide a unique opportunity for guiding the country towards new food habits. The Ministry of Food has already done a great deal through the instructions it has given the community, but more could be done towards popularising the greater use of salads and vegetables, particularly in schools, hospitals, canteens, restaurants, etc.

(3) *New legislation is necessary.*

The benefits to health of food of superior quality, and of conservative cooking, and of wholewheat bread, fresh greenstuffs and fruit should be stressed. The way in which ill-health and disease result from the destruction of food values by heat, chemicals, staleness, separation, adulteration, ignorance and waste should be pointed out, and power should be given to local authorities to take drastic action. *A plainly worded statement on every package and bottle of food preparation stating their composition should be compulsory.* There should be immediate legislation giving powers to the appropriate Ministry, comparable with those possessed by the United States Federal Commission, to deal with food advertising and to require firms to desist from misrepresenting the value of and the results obtained from the consumption of their products.

(4) *The "Grow More Food Campaign" of the Ministry of Agriculture must be supplemented by a "Better Cultivation Campaign".*

The fertility of the fields of the homeland for the production of fresh foodstuffs is the foundation of the public health system of the future. It is a reflection on our intelligence and our economic system that, at an immense outlay, the valuable wastes of our towns and cities, which could be profitably used in the creation of humus for the market gardener, fruit grower and farmer, are cast into the sea or otherwise destroyed. Used on the land, they would give a more fertile soil which would yield healthy crops, ensuring healthy livestock, and, most important of all, a race of healthy men and women. As a first step, the overdraft on the soil, caused by the employment during the war of enormous quantities of artificial fertilisers must be repaid. The nation needs the best that the best possible soil can produce.

(5) *Nothing should be permitted to interfere with the reform of our food supply and the institution of a real system of preventive medicine.*

The nutrition and health of the people must obviously come first. The wealth of a nation lies in the energy, initiative and moral fibre of its people. Without these attributes no country can remain permanently prosperous. Our chief possession is ourselves.

((Signed) HORDER (*President*), NORMAN BENNETT (*Chairman, General Purposes Committee*), T. H. SANDERSON-WELLS (*Chairman, Executive Council*), STELLA CHURCHILL (*Vice-Chairman, Executive Council*), G. E. FRIEND (*Hon. General Secretary*), J. E. FOX (*Hon. Asst. Secretary*), G. E. W. CROWE (*Chairman, Press and Publicity Committee*), A. W. JOHNSON (*Treasurer*).

Maintenance of Plant in Closed Factories

THE Ministry of Fuel and Power states that the attention of the Ministry's Fuel Efficiency Committee has been drawn to the fact that *there are a number of cases—few in proportion but substantial in total—of wasting fuel* in factories which have been closed in concentration schemes, and where heating is still maintained in order to keep the disused production machinery in suitable condition.

It is recognised that plant maintenance requirements vary widely not only between industry and industry, but between one type of plant and another, and *there is evidence that there are* frequent cases where precautions can be taken to protect plant without the need for specially heating the building.

Representative bodies of industries which have been concentrated have been asked to survey the conditions in closed factories in order to ensure that, wherever possible, the heating of buildings for plant maintenance purposes is eliminated in favour of other protective methods, such as spraying metal parts with anti-rust-preparations and turning over periodically, or applying heavy grease and covering with sheets.

In factories where only part of the premises is closed down, it might be possible to arrange for machinery in the disused part of the factory to be transferred for storage purposes to some part of the occupied and heated premises.

It should normally be possible, where heating is essential to preserve valuable plant, to achieve the necessary standard by the use of lower grade fuels than would be required if the boiler plant were run at full load, and in this way to dispense with high-grade coals which are in particularly short supply.

The fuel supply position is such that the utmost economy must be exercised, and it is with this in mind that managements of closed or partly closed factories are urged to survey the position to ensure that every possible means of saving fuel is *adopted before the colder weather begins.*

In case of difficulty refer to your Trade Association Fuel Efficiency Committee or to the Regional Fuel Efficiency Committee, whose members will be willing to advise and help you.

News from the Industry

APPOINTMENTS

Ministry of Food—Second Secretary (Acting)

The Minister of Food has appointed Mr. J. P. R. Maud, C.B.E., to be a Second Secretary (Acting) to the Ministry of Food in the absence of Mr. E. Twentyman, Second Secretary, who is serving with the British Food Mission in Washington.

* * *

Area Milk Officer

Mr. James D. Steel, manager of the Northern Co-operative Society's dairy department in Aberdeen, has been appointed Area Milk Officer for Scotland—a Ministry of Food post. He took up his new duties on October 1, with headquarters in Glasgow.

* * *

Mr. Charles C. Reid

The Minister of Fuel and Power announces that he has appointed Mr. Charles C. Reid, who is at present Regional Production Director in Scotland, to be Director of Coal Production at Headquarters. Mr. Reid will take up his new appointment on October 1, 1943.

The post of Director of Production was created in accordance with the Government White Paper on Coal issued in June, 1942 (Cmd. 6364).

* * *

Divisional Food Organisation

The Minister of Food has approved the following changes in the Divisional Food Organisation:

Major F. V. Shaw, D.S.O., M.C., who has rendered valuable service to the Ministry as Deputy-Divisional Food Officer, North-Western Division (Liverpool Liaison Office), has resigned his appointment on being recalled to the Royal Insurance Company.

Mr. R. F. Allmey has accepted the appointment vacated by Major Shaw and took up official duty as Deputy-Divisional Food Officer, North-Western Division (Liverpool Liaison Office), with effect from October 1, 1943.

Mr. J. Innes, C.B.

The Minister of Fuel and Power has appointed Mr. J. Innes, C.B., to a newly created post of Director of Opencast Coal.

Mr. Innes has up to the present been employed as Director of Services at the Ministry and in this capacity has dealt with the supply and distribution of solid fuel.

Mr. William Mabane, M.P., in Canada

Mr. William Mabane, M.P., Parliamentary Secretary to the Ministry of Food, has just completed a speaking tour in Canada. In the course of this tour, undertaken in response to a Canadian invitation conveyed through the United Kingdom High Commissioner, Mr. Mabane has delivered a series of addresses under the heading "Feeding for Fighting" to audiences in Toronto, Regina, Winnipeg, Montreal and Ottawa.

On each occasion Mr. Mabane expressed warm thanks to the Canadian people from the Ministry of Food and the people of the United Kingdom for their generous aid in sending to wartime Britain great quantities of vital foodstuffs, especially wheat, bacon and ham, cheese and canned fish. Mr. Mabane assured his audiences that these contributions had been of essential help in providing a diet which, while adequate to maintain the fighting fitness of the people of this country, was no more than adequate and always tended toward monotony.

In each of his addresses, Mr. Mabane gave a general account of the work of the British Ministry of Food. On the different occasions he elaborated some special aspect of the subject, such as the feeding of mothers and children, food for war workers, the relations between food and agriculture, the special problems of the procurement, transport and rationing of food supplies and the influence of the Hot Springs Conference upon the future prospects of the world food supplies.

Dr. Margaret Mead

To complete her tour of Scotland, Dr. Margaret Mead, the American food expert, attended a recent session of the Nutrition Committee in Edinburgh. She was specially invited by Professor David Murray Lyon, the chairman, to attend the meeting, which discussed the Hot Springs Conference decisions.

* * *

Food Adviser at Bengal

Mr. W. H. Kirby has been "lent" as food adviser to the Government of Bengal. Mr. W. H. Kirby was the Ministry of Food's divisional food officer for London almost from the beginning of the war until May of last year. During the raids he was in charge as executive officer of the organisation which brought milk and bread to the people each day and secured them their weekly rations when shops and stores had been destroyed, and the extra improvisations of mobile canteens and communal restaurants were under his ultimate control, though run by many agencies.

Spices Controlled

Cinnamon, mace and nutmeg are to be controlled by the Ministry of Food. Those who on June 30 owned stocks of 10 cwts. or more of cinnamon, 20 cwts. or more of mace or nutmeg, were directed to make a return to the Ministry of Food not later than September 25.

* * *

Zoning of Pickles and Sauces

The Minister of Food made an Order amending the Pickles and Sauces (Control and Maximum Prices) Order, 1942 (S.R. & O. No. 594), which brought into operation on October 17 the scheme for the zoning of the distribution of pickles and sauces. The number and compositon of the zones, together with the main provisions of the scheme, have been announced.

Edible Oils

The Ministry of Food has announced that the Edible Oils and Fats (Control of Sales) Order, 1943 (No. 701), has been amended, with effect from October 10, 1943, by the exclusion of petroleum or any products of petroleum from the definition of "edible oil".

* * *

English Wheat in Grists

As from September 20, the proportion of home-grown wheat used in millers' grists was further increased, especially in the North-Western area where hitherto the usage of home-grown wheat has been at a lower rate.

On September 27, the proportion was again increased and by that date in nearly all areas the minimum rate of usage of home-grown wheat in millers' grists was 50 per cent. The position in Scotland and Northern Ireland remains unchanged.

The compulsory fixed percentage of 10 per cent. diluents continues, and the admixture of imported flour is at the rate of 7½ per cent.

* * *

Decontamination of Food

There took place recently in Worcestershire a demonstration of food contamination, arranged in conjunction with the Ministry of Food, for the benefit of food decontamination officers in the Midland Division. At the first session the spectators saw members of the Porton Chemical Defence Experimental Station, who are responsible for research into all the forms of offence and defence in this kind of warfare, contaminate various foodstuffs with mustard gas, and at the second session the goods were decontaminated.

Canned goods were decontaminated simply by immersion in wire baskets into bleaching paste, flour by aeration, and potatoes by hosing and aeration. This is satisfactory providing that such foodstuffs as the two last mentioned have not been heavily contaminated, in which case they would be declared unfit for consumption and destroyed.

The corps, in anti-gas clothing, was under the supervision of Mr. H. E. Monk, County Analyst, and Mr. Woollcott.

Dehydrated Jam

Experiments in the production of jam powders—dehydrated jam—have been outstandingly successful, announces the Department of Scientific and Industrial Research.

It is possible that after the needs of the fighting Services have been met, supplies left over will go to confectioners for sandwich fillings, flavourings, or as a spread for cakes.

* * *

Licensing of Manufacture of Baking Powder

The Minister of Food made an Order under the Manufactured and Pre-Packed Foods (Control) Order, 1942, appointing September 19, 1943, as the date on which it was obligatory upon manufacturers of Christmas puddings to hold licences. The same Order appointed September 26, 1943, as the date on which it became obligatory upon manufacturers of baking powder and bakers' cream powder to hold licences. Returns submitted in accordance with Article 2 of the Principal Order will automatically serve as applications for such licences, and manufacturers who have rendered returns need take no further action.

It was an offence after September 19, 1943, for any person to sell Christmas puddings, and will be an offence after December 19, 1943, for any person to sell baking powder or bakers' cream powder, unless they have been manufactured or pre-packed in accordance with the terms of a licence granted under this Order.

In the case of Christmas puddings, bakers holding a licence to manufacture cake or to produce bread, who were engaged in the manufacture of Christmas puddings during the year ended September 3, 1939, are authorised to manufacture and pre-pack Christmas puddings without the necessity for obtaining a licence under this Order if they comply with the conditions regarding ingredients and price contained in the Schedule.

Correspondence in reference to the Order should be addressed to Ministry of Food, Miscellaneous Foods Branch, Colwyn Bay, Denbighshire.

Sugar Beet in Canada

The Manitoba Sugar Company advises from Winnipeg that of 16,500 acres in sugar beets, approximately 14,000 acres will yield, weather conditions remaining favourable, in the neighbourhood of 115,000 to 118,000 tons of beets this season.

* * *

The Bread Boards (Restriction on Use) Order, 1943

The Minister of Food has made an Order—the Bread Boards (Restriction on Use) Order, 1943—primarily to conserve timber, regulating the use of bread boards and bread, cake and flour confectionery trays, which came into force on October 17, 1943. The Order requires every person in charge of such containers to exercise care in their use and storage and to keep them dry, sound and clean. The containers may not be used for any purpose other than the transport, storage or display of bakery products (unless they are no longer fit for such purposes) and must be returned promptly to the owner. No person may use any such container belonging to another person without the consent of the owner.

* * *

Food Control Committees (Constitution) Order, 1943

The Minister of Food has revoked the Food Control Committees (Constitution) Order, 1942, and re-enacted the provisions with certain modifications. The main changes are as follows:

(*a*) Provision has been made for the appointment of a trade (employee) member on every Food Control Committee or Joint Food Control Committee, and employees in retail food shops will be eligible for appointment, but, with the exception of managers, employees will now be ineligible for appointment as trade members.

(*b*) In order to preserve the balance of representation between consumer and non-consumer members, Local Authorities will have discretion to appoint up to two additional consumer members.

(*c*) Provision is made for a Committee's term of office, which previously expired on December 31, to continue until the new Committee is constituted.

Coke Supplies

The Minister of Fuel and Power announces that as from October 1 coke of all sizes was temporarily freed from the restrictions on supplies.

* * *

Canada Reduces Grain Insurance Rates

An Order in Council issued recently in Ottawa brings into effect a 20 per cent. cut in the war-risk rate for the insurance of grain in stores or in transit in Canada.

This reflects the reduction in the risk of bombing "in view of the position of the Allied nations in the war in recent months".—*Reuter.*

* * *

New Paper Control Order

The Ministry of Supply has issued a new Control of Paper Order which imposes certain restrictions on the publication of diaries. The permitted size of calendars is also reduced.

The principal provisions of the Order are as follows:

Manufacturers of diaries may not use for this purpose more than 25 per cent. of the quantity of paper which they consumed in 1939.

Restrictions are placed on the size and weight of diaries and also on the substance of paper used.

* * *

Control of Fertilisers

The Minister of Supply has issued the Control of Fertilisers (No. 27) Order, 1943, which revokes and remakes in consolidated form with amendments the Control of Fertiliser Orders, Nos. 5, 10, 17, 19, 21, 23. These Orders provided maximum prices for certain potash, sulphate of ammonia, basic slag, triple superphosphate of lime, ordinary superphosphate of lime, ground phosphate and compound fertilisers.

The principal amendment is that the maximum price of ordinary superphosphate of lime in Great Britain is now based on a standard price of £5 10s. per ton.

Prices for Great Britain and Northern Ireland are in separate schedules.

Dried Eggs and Cheese

According to Mrs. A. G. Astin, Food Advice Organiser for the Ministry of Food on Merseyside and in Cheshire, dried eggs and cheese are not sufficiently used in catering establishments and canteens. Only 20 per cent. of the amount of dried eggs to which they were entitled was being used in these establishments, and the amount of cheese for use was nothing like so much as it should be.

* * *

Canned Fish (Maximum Prices) Order, 1943

The Minister of Food has made an Order amending the Canned Fish (Maximum Prices) Order, 1943, which came into force on September 26, 1943.

The amendment reduces by 9d. per case the maximum price at which canned fish may be sold by a first-hand distributor to a wholesaler, thus increasing the margin of profit which may be earned by a wholesaler.

No change is made in the maximum prices on sales to a manufacturer, to a retailer, or by retail.

* * *

Dogfish

Dogfish, menace to fishermen—they feed on their catches—may soon provide a new source of revenue to the Scottish fishing industry.

Coarse and dry in texture, dogfish have never been saleable except under assumed names. But all that may be changed. The livers of these fish are exceptionally rich in vitamin A, and vitamin D, the essential vitamin of cod and halibut liver, is also present.

The Marine Biological Station at Millport has found that fish meal made from dogfish flesh has a phenomenally high nitrogen content and is, therefore, a very powerful manure.

"An organised dogfish fishing industry in West of Scotland waters would not only be likely to prove a profitable proposition in itself, but would benefit the general fishing position enormously by keeping the dogfish scourge within reasonable bounds."—*Sunday Dispatch.*

Meat Dehydration in U.K.

A "pilot plant" for the manufacture of dried meat—the first in the United Kingdom—has just been brought into operation in Northern Ireland.

* * *

Control of Dehydration

At a recent conference held by the National Food Distributors Association at Chicago, a speaker declared that food spoilage will be common unless adequate automatic control is exercised in the dehydration of foods. Control should be applied to all stages from blanching to drying.

* * *

Dehydrated Fish

Consumer tests with dehydrated fish are to be carried out by the Ministry of Food in order to get public palate reaction to dehydrated fish, states an *Evening Standard* reporter. Restaurants and factory canteen customers in parts of the country will be eating dehydrated fish without knowing it.

* * *

New Zealand Dried Meat for U.K.

The New Zealand Government has contracted to supply Britain with 2,500 tons of dried meat, equivalent to 14,000 tons of carcase meat, as soon as possible, the chairman of the Meat Board announced in Wellington recently. He added that New Zealand is prepared to double this quantity next year.

* * *

Dehydration in Canada

Prime Minister Adelard Godbout, of Quebec, announced the early establishment of a dehydration plant for vegetables at Laprairie, near Montreal. The plant, which began operations about the middle of September, is the first of its kind in the Province, although eight others are already functioning elsewhere in Canada.

The owners of the new enterprise state they will concentrate on carrots, cabbages and turnips for the present, but add they will be using the newest methods available, which have been highly perfected, due to wartime exigencies.

Grape Juice Used for Sugar

Concentrated grape juice is to be used instead of sugar in Portugal, following experiments proving the value of grape sugar.

It will be used principally for making cakes, jam, chocolate, liqueurs, various kinds of medicines, champagne and ice cream.

Senhor Andre Navarro, Under-Secretary for Agriculture, announced that this step was necessary because of curtailed imports of sugar and exports of wine.—*Reuter.*

* * *

Test for Ethylene

The most delicate test for minute quantities of ethylene is a sprouted pea seed, which is capable of detecting 1 part in 20 to 40 million parts of air. The method depends upon the fact that a pea seedling in the presence of ethylene does not continue to grow vertically, but bends towards a horizontal position owing to unequal growth due to the ethylene stimulation of the growing tissues. It is described by P. W. Rohrbaugh of the California Fruit Growers Exchange in *Plant Physiology*, 1943, **18**, 1, p. 79.

* * *

Vitamins for Europe

The chemical industry will have an important part to play in the first-aid stage of food relief on the Continent when the United Nations invade. This view is maintained in a new book, "Starvation in Europe", by the Australian-born biochemist, Dr. Geoffrey H. Bourne, now working at Oxford. He disagrees with those nutrition experts who say that it is better to use natural foods as a source of vitamins than to use concentrates and synthetic preparations, and calls attention to the fact that vitamin C tablets can be flown to a particular town in a few hours, whereas the transport of even orange juice and black-currant concentrates would involve much slower transport. The indications are that before the war is over there will be a considerable amount of scurvy, especially in some areas, and we shall therefore need to use every form of vitamin C we can lay our hands on.—*Chemical Age.*

60 Years Ago

"A box of bread was opened last week at the Town Hall, Liverpool, which was packed at Rio de Janeiro nearly two years ago, and proved as sound, sweet, and as good in all respects as on the day when it was enclosed. The bread is manufactured of a mixture in certain proportions of rice, meal and wheat flour. The coarsest quality flour may be used and will produce bread not inferior to that of the finest description made by the normal method. It was stated to be very nutritious and certainly anti-scorbutic, while M. Alzard, the discoverer of the process, asserts that the bread would keep two centuries without the slightest alteration."

* * *

High Melting-Point Butter

A butter that will not melt in tropical heat has been produced by Australian research workers and is counted one of the chief food discoveries of the war. Such butter will be a blessing not only to troops, but to civilians working in hot climates. "Tropical Spread", as it is known, is said to be first-class butter, rich in flavour, free from chemical adulteration and unusually rich in butter-fat. It spreads easily, but remains firm in spite of high summer temperatures. Those who have spooned on to bread the oily, salty mass of ordinary tinned butter will appreciate what this means. For more than a year Dr. Wiley and Mr. Loftus Hills, with a band of workers, experimented in the laboratories of the Commonwealth Council for Scientific and Industrial Research. The Queensland Butter Board acted in close collaboration with them, trying out on a commercial scale the laboratory formulæ. Last February the first commercial quantity was prepared by the Board, and samples went to troops in New Guinea and Northern Australia. Their reports were enthusiastic. The "spread" is obtained by dehydrating creamery butter and extracting from it the pure butter-fat, which is then boiled. To it is added a small quantity of salt, skimmed-milk powder and 19 per cent. of hydrogenated butter-fat to increase the melting-point to 105° F.

£250,000 Food Plan

A mission of U.S. agricultural experts is now working with the Venezuelan Ministry of Agriculture on a £250,000 plan for producing more food in Venezuela, which has long neglected agriculture. It is a three-year plan to train the small farmer in up-to-date methods.

* * *

Chinese Exotic Fruit

It is reported from Victoria, British Columbia, that the mao-li-dzi, a Chinese fruit which looks like a plum, has seeds like a fig and tastes like a strawberry, and grows on a vine like a grape, has come into flower in Canada for the first time. This is felt to be of more than passing importance, for it may mean a profitable addition to British Columbia's future horticultural productions. Credit for introducing the mao-li-dzi (hairy plum) goes to J. B. Munro, Deputy-Minister of Agriculture, at whose garden in Victoria the vine has come to maturity and bloomed for the first time.

* * *

Paper Loaf Pan

A unique all-paper loaf pan in which meat loaves and other meat products may be directly processed won the major award in the meat products classification of the twelfth annual All-America package competition sponsored by *Modern Packaging*. The prize-winning package consists of an inner liner of grease-proof paper and paperboard, laminated with a waterproof adhesive, which is used in combination with an outer tray of corrugated paper. Both containers actually hold the meat while it is being cooked, without breaking down or being adversely affected by the heat of processing. The outer tray may be used a number of times, while the inner liner is changed for each loaf.

The container, according to *Modern Packaging*, is specially interesting since it goes through the regular processing operations for which a metal pan was required. Being economical, sanitary and requiring no washing, these paper pans are already in use by a great number of meat packing companies.

OBITUARY

Gerald John and and Gordon Sidney Mansfield

We regret to record the death, on August 30, 1943, of Pilot-Officer Gerald J. Mansfield, R.A.F.V.R., aged 20 years, in a flying accident in Canada, and Sub-Lieut. Gordon S. Mansfield, R.N.V.R., aged 21 years, in November, 1942, while serving on the Aircraft Carrier *Avenger*. Both were sons of Mr. S. R. Mansfield, a Director of Messrs. Polak and Schwarz (England), Ltd.

Gordon Sidney Mansfield spent some time in the laboratories and factories of Messrs. Polak and Schwarz in Holland. He was well-known to a number of friends in the trade as he acted as junior representative for that company in London and the Southern counties, also in the Irish Free State and Northern Ireland.

Gerald John Mansfield joined the Cambridge University Air Squadron in 1941, while studying chemistry at Christ's College, Cambridge.

* * *

Mr. Henry F. M. Merness

Mr. Henry Francis Minana Merness has died at Buenos Aires at the age of fifty-nine. He was a native of Liverpool, and became one of the best-known Englishmen in the Argentine, where he owned large poultry and farming interests. He gave 250,000 eggs for wounded servicemen during the last war and 6,000,000 during the present one.

* * *

Japanese Scientist Dies

Dr. Umetaro Suzuki, Japanese scientist, who claimed to have discovered vitamin B_1, has died at the age of 69, said the Japanese news agency, quoted by Reuter.

He also found a formula for synthetic wine. Dr. Suzuki had studied in France, Germany and the U.S.

Industrial Bacteriology Lectures

Mr. L. D. Galloway will shortly be resuming his course of evening lectures (discontinued since 1939-40) on Industrial Bacteriology at the Chelsea Polytechnic, Manresa Road, London, S.W. 3.

Change of Address

Mass Observation have moved to new offices. All communications should be addressed to 21, Bloomsbury Street, London, W.C. 1. Tel.: Museum 6811.

* * *

Fruit in 1944

The best raspberries in Britain come from Scotland. That is the opinion of Mr. S. Smedley, chairman of the National Canning Company.

Of the 4,000 Scottish acres of fruit bushes, 1,000 are devoted exclusively to raspberries. They produced well over 1,000 tons last year.

The best blackcurrants, says Mr. Smedley, come from North Norfolk, and the finest plums are grown at Evesham.

Mr. Smedley fears that 1944 will be a bad year for fruit. This is partly due to wartime restrictions, which, in the case of raspberries, have discouraged the planting of new canes. The old ones will not produce so well next year.

* * *

Sir Francis Joseph

Sir Francis Joseph, Bart., K.B.E., D.L., Chairman of the Government-owned United Kingdom Commercial Corporation and Past-President of the Federation of British Industries, has accepted an invitation to be the first Honorary President of the National Society of Caterers to Industry.

"As an industrialist I am keenly interested in the great development made during the war in extending canteen facilities for the workers in industry," Sir Francis said recently. "There can be no question that the canteens have contributed materially both to increased output and to the maintenance of the health of the workers under the strain of war. It will be a matter of national importance to continue the canteens after the war and to improve them, as will be possible with the removal of inevitable wartime restrictions. In this work I want to see the closest collaboration between industrialists, the workers themselves and the caterers. It will be my aim as Honorary President of the Society to bring this about."

Lieut.-Colonel M. W. Batchelor

We were sorry to hear that Colonel M. W. Batchelor has just had a final War Office Medical Board and has received the finding that he is permanently unfit for any further form of military service, and has consequently relinquished his commission with H.M. Forces and has been granted the honorary rank of Lieut.-Colonel. Colonel Batchelor has the unique record of having served with all three Services—being with the R.N.V.R. in the last war, commissioned in the R.A.F.V.R. in early September, 1939, and transferred to the R.A.O.C. in December, 1939. He went to France with the local unit of the R.A.O.C. early in 1940 and took part in the evacuation from Dunkirk, being mentioned in despatches for his work in that campaign. On his return, Colonel Batchelor commanded several Field units, and before his illness filled an important administrative post at the largest ordnance depôt in the country. He is resuming his position as deputy chairman and joint managing director of Batchelor's Peas, Ltd., Sheffield. We understand that he will also resume his interest in welfare and political matters.

* * *

Brush-Metro-Vick Co-Operation

The Brush Electrical Engineering Company, Limited, and Metropolitan-Vickers Electrical Company, Limited, announce that they have fused their interests in the Battery Electric Vehicle Industry.

Industrial Law for Executives

The Industrial Welfare Society's Correspondence course in Industrial Law has proved of great benefit to a large number of persons who have since the war been drafted into executive positions in industry and who required a working knowledge of industrial law, but who could not afford to give a prolonged study to the subject. The course consists of six lectures, each of which can be read in 1 to 1½ hours, and students are invited to submit any questions they wish on the lectures. The lectures are normally sent weekly, but they can be sent all at once or at longer intervals at the wish of the individual student. Particulars can be obtained on application to the Secretary, Industrial Welfare Society, 14, Hobart Place, London, S.W. 1.

* * *

Vegetable Flame Peeler

A flame peeler has been used by a New York canning company to prepare vegetables for newly installed dehydrating lines. So successful has been the operation that it may prove a satisfactory unit for use in canning operations as well as for dehydrating.

The peelers originally were designed for use on pimentos in the south. They have been tried experimentally on carrots and should prove satisfactory for similar root crops.

The peeler consists of a large rotating metal cylinder lined with a refractory brick worm which carries the product through the cylinder during the flame treatment. An intense flame is blown into the cylinder through the intake end. As the vegetable passes through the outer surface is charred. A forceful stream of water at the output end of the machine washes off all the charred peel and the vegetable is ready for the inspection and preparation line.

The advantages of the flame peeler are said to be fast production with a minimum waste of material, since there is no abrasion beyond that of the water spray which cannot penetrate deeper than the heat treatment.—*National Can Corporation, New York.*

OBITER DICTA

● The Battle for our Breakfasts has been won.—*"Victory" Editorial.*

● A mill manager's life at a port mill is one long nightmare.—*A technical authority reported in "Milling".*

● There is a prospect that before long not only milk but eggs will be pasteurised.—*"Birmingham Post."*

● Extensive farm fires are occurring far too frequently. The rule of no smoking near ricks must be enforced.—*Mr. R. S. Hudson, Minister of Agriculture.*

● I have often heard people singing the praises of home-made jam, but actually factory jam is a better product.—*An industrial chemist to Vincent J. Walker.*

● The nation and the Army have suffered dreadful things in the past from the deceptively attractive but pernicious white bread of the last 50 years. I have been told on very high authority that to-day not more than 5 per cent. of recruits for the Army had a good set of teeth.—*Lord Hankey, in the House of Lords.*

● Food is a decisive weapon of war. Victory depends as much on our ability to produce food as on our ability to manufacture guns, planes and ships. Our army of farmers and processors are fighting an important battle on the food front. Working diligently and skilfully, they are speeding this nation and our Allies to victory.—*U.S.O.W.I.*

● We in this country, having benefited during four years of war from favourable food conditions, may find ourselves better off in this respect (after the war) than our neighbours on the Continent. We believe we should be prepared for some plan for sharing our rations with others as a witness to our common humanity and as a first step towards rebuilding international friendship. We welcome the Government's recent decision to set aside stocks of chocolate for immediate use after the war for children in Europe, and we should like to see this principle extended to include other necessaries of life.—*Minute passed at Friends' Yearly Meeting at Friends' House.*

Canadian Soya

Victoria, British Columbia, has about 850 acres planted to soya beans this year, and prospects are that this acreage will be increased in 1944, according to Department of Agriculture officials. Creston is the big soya bean producer, with some 700 acres, while 150 acres were seeded in Okanagan. The bulk of the sowing has been of the edible variety of bean, but some acreage is being utilised for the variety that is of industrial value. While Tom Hill put in an experimental plot of soya beans at Coldstream more than ten years ago, the production in the first year or two has been centred in the Creston area. The department has been testing the suitability of different parts of the province with experimental plantings for some years.

* * *

Smoked Ham Test

How much smoke a ham has had used to be decided on the basis of its smoky appearance, says the Agricultural Research Administration, U.S. Department of Agriculture. Now scientists of the Bureau of Agricultural Chemistry and Engineering, working on various food problems of interest to the fighting services, come forward with a chemical test to show how much smoke meat has absorbed and how deeply the smoke has penetrated.

There are phenols in wood smoke, more in some kinds than in others, and they are the basis of the new test. The important problem solved by the chemists preliminary to development of the test was to distinguish between the phenols in the unsmoked meat and those added in smoking. The reagent used is 2:6 dichloroquinonechloroimide, which gives an intense blue colour with phenols.

Modern smoking of meat is intended more as a way of flavouring than of preserving, and refrigeration is usually necessary to keep such meats if they are to be held for any considerable time. The new method makes it possible to check on the thoroughness of smoking and on the penetration. It is designed to take the place of testing by appearance, smell, and taste.

Post-War Nutritional Relief

The Nutrition Society has arranged a whole-day conference on "Post-war Nutritional Relief" at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, on Saturday, November 6. The Chair will be taken by Lord Horder, and papers will be read by Professor J. R. Marrack ("Past Experience and Present Position"), Dr. J. Hammond, F.R.S. ("Problems of Production in Relation to Post-war Nutritional Relief"), Miss E. M. M. Hume ("Opportunities for Nutritional Research in the Work of Relief"), and others.

Further details of this meeting, and of the Nutrition Society, can be obtained from the Hon. Secretary, Dr. Leslie J. Harris, Nutritional Laboratory, Milton Road, Cambridge.

* * *

Colonial Food Yeast

Colonial Food Yeast is the name of a new private company which has been formed with a capital of £100. The objects are to carry on in the British Colonies and elsewhere the business of producers, manufacturers and distributors of and dealers in a product known as Food Yeast and other products intended to improve the nutritive value of human or animal foods. The subscribers (each with 50 shares) are: Messrs. G. Caine and C. Y. Carstairs, both of the Colonial Office.

The first directors are to be appointed by the subscribers. The Secretary of State for the Colonies may appoint and remove directors and control allotments and transfers of shares.

* * *

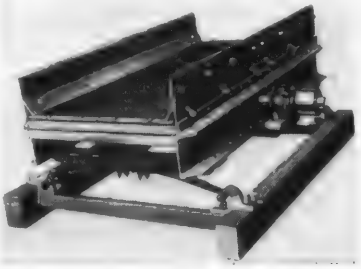
South African Dehydration Factories

According to Dr. G. Dreosti, officer in charge of dehydration and cold storage in South Africa, dehydration will take its place beside canning as a permanent processing method, although it was primarily a war method of preserving foodstuffs. South Africa already had six factories producing, or about to produce, dehydrated foodstuffs. At the moment they were producing mainly dehydrated potatoes, cabbages, carrots and onions.

Sieving of Foodstuffs

The sieving (or screening) of ground or compressed nut, bonemeal, oils, resins, meal, etc., has been very successfully carried out on two distinct types of vibrating screen, manufactured by Pegson, Limited.

These units (*a*) "Live-wire" and (*b*) "Open-deck" are almost silent in operation, inexpensive to instal and maintain, and require little power to drive.



The vibrating unit (mechanism) in each case is placed transversely across the main frame of the screen and consists of a heavy steel shaft, machined to accurate limits, mounted in sealed dust-proof ball bearings. To the shaft are fixed two out-of-balance weights which, when the shaft is driven at approximately 18,000 r.p.m., impart an intense but gentle vibratory action to the whole of the screen cloth (or mesh).

These meshes are easily changed, and both types of screen can be fitted with dust covers. The "Live-wire" is made as a single or double-deck, the "Open-deck" as a single-deck only.

* * *

X-Ray Analysis Group

In response to the request made by the Second Conference on X-Ray Analysis, which was held in Cambridge in April last, the Board of the Institute of Physics has authorised the formation of an additional Group under the auspices of the Institute. The new Group is empowered to arrange meetings and conferences and generally to be a medium for the exchange of information on matters relating to X-ray diffraction.

The Organising Committee of the Conference was requested to act as the first Group Committee, and it has elected Professor Sir Lawrence Bragg as Chairman of the Group and Dr. H. Lipson as Hon. Secretary and Treasurer. The inaugural meeting of the Group was held in Manchester, jointly with the Manchester and District Branch of the Institute, on October 16; Sir Lawrence Bragg gave the opening lecture, "The Physical Optics of X-Ray Analysis," followed by other papers on some industrial applications of X-ray analysis.

All interested in the Group, whether Members of the Institute of Physics or not, are requested to send their names and addresses to Dr. H. Lipson, F.Inst.P., The Crystallographic Laboratory, Free School Lane, Cambridge, from whom further details may be obtained. Membership of the Group is open without payment of additional fee to Fellows, Associates, Students, and Subscribers of the Institute of Physics.

* * *

American Chemical Society

At the 106th Annual Meeting of the American Chemical Society at Pittsburg in September some interesting papers in the fields of fertiliser production and food chemistry were read. Among these were "Protein Foods—War and Post-war", by Ross A. Gortner, Jr., of the National Research Council, Washington, D.C., and "The Suitability of Some Plant Proteins for Replacement of Animal Proteins in a Wartime Food Economy", by D. Breese Jones, of the Bureau of Human Nutrition and Home Economics, Beltsville, M.D.

Other papers were "Sulphur Dioxide Solution as a Preservative for Fruits and Vegetables", by J. G. Woodroof, of the Georgia Experimental Station, and "A New Method for the Manufacture of Wheat Starch", by Richard O. Slotter, of the Northern Regional Research Laboratory, Peoria, Ill.

* * *

New Uruguayan Meat Agreement

The Uruguayan Government has authorised its diplomatic representatives in London to conclude a new meat agreement with Great Britain.

Lever Brothers and Unilever Limited

The following is an abstract of the Chairman's review, taken as read at the Annual General Meeting of the company on October 7.

With reference to the soap trade, the outstanding event was the introduction of rationing in the second week of February, 1942. The scheme worked smoothly from the outset, and the Ministry of Food are to be congratulated on the result. The effect has been to reduce the consumption of oils and fats used as soap in the home by approximately 18 per cent. for 1942. The effect in 1943 will be slightly greater.

There was substantially no change during the year in the margarine trade, which continues to be carried on for Government account. The company plays an important part in the provision of the necessary vitamins for this product.

Seed crushing showed a slight increase in 1942, but continued to be below the pre-war level. Refining and hardening remained above normal. The volume of animal feeding-stuffs continued to contract, but there has been some improvement in recent months.

The main event in the food group was the discontinuance of ice cream manufacture in September, 1942. This has not affected the trading result for the year, but will be felt in 1943. A new addition to this group in 1943 has been the acquisition of a large interest in Frosted Foods Limited, which holds an important position in the production of quick-frozen foodstuffs.

At various dates during 1942 the production of such foods as canned, bottled and frozen vegetables and fruit, fresh meats, sausages, and all manufactured and pre-packed foods, with certain exceptions, has been brought under Government control. This has had the effect of reducing turnover, which will be reflected in the 1943 figures.

Treating of trading overseas, the report states that the upward trend of the company's businesses in India, Canada, Australia and South Africa was checked towards the end of the year by the shadow of raw material shortages, caused by the development of the war in the Far East. Outputs did, however, reach new high records in both Australia and South Africa. In Canada, supplies were curtailed to 1941 levels, but the full effect of this will not be felt until 1943. In India the restriction was not felt until the current year. In this market it has not been possible for Government controls to be instituted, and a considerable element of speculation has developed. The Ceylon factory, which commenced operations in 1941, had a successful year. The production of margarine in Palestine and soap in Nigeria was substantially expanded during the year.

The activities of the United Africa Company have been maintained at a high level.

During the year research work was concentrated on problems connected with the war effort and on investigations undertaken at the request of Government Departments. The board are very mindful of the importance of all sections of the business keeping in the forefront of new developments. A new Central Research Laboratory was completed and occupied during the year, which provides for the considerable additional staff required to carry out enlarged programmes of research that have been decided upon, and also provides facilities for work on food products that have been lacking hitherto.

The preoccupation of all senior personnel with day-to-day affairs necessarily limits consideration of post-war problems, but some progress is being made. The trend of future developments is being studied, particular attention being paid to the best methods for re-employment and re-training of personnel now in the Forces, and the national policies for education and the location of industry.

* * *

Sugar Confectionery (Wartime) Association

Presiding at a general meeting of the Sugar Confectionery (Wartime) Association at Leeds on September 29, Mr. Sydney W. Pascall reviewed at some length the work of the Association during the past twelve months, with special reference to the zoning and concentration problems.

Maynards

Maynards (manufacturing and retail confectioners) is maintaining ordinary dividend at 8 per cent., less tax, for the year June 30 last. Issued ordinary capital is £389,600. The £1 shares stand at 27s. 6d.

* * *

Jamaica Pimento for Russia

More than a third of Jamaica's pimento crop—which has been bought by the British Government—will go to Russia. Pimento, or all spice, which grows on a tree found only in Jamaica, is mainly used for spicing and curing meat.

* * *

Tinned Antelope

The suggestion that Southern Rhodesia should tame its eland—the largest living antelopes—and export their meat instead of beef has been made by A. W. Redfern, a well-known big game photographer.

Thirty or forty calves could be caught yearly at the Wankie Game Reserve for farmers, he said. "Rhodesian beef will never be famous, but eland exports and canned venison of the other Rhodesian antelopes that could be domesticated instead of exterminated might make the colony's name," Mr. Redfern added.

* * *

Wholesale Prices in September

Few changes occurred in wholesale prices last month, but *The Financial Times* index number rose by 0·4 per cent. from 150·4 to 151·0 (1938 = 100). The food index was unchanged at 136·1, but the materials index rose by 0·6 per cent. from 157·6 to 158·5 (1938 = 100).

Among food prices, English barley and oats were fractionally higher after their August decline, but the move was not pronounced enough to affect the general index. In the materials group a decline since early August in the price of jute was more than offset by a rise in tallow.

Compared with a year ago, food prices have fallen by 1 per cent., while materials have risen by 2·2 per cent. The total index has risen by 1·1 per cent. Two of the August indices have been revised.

Information and Advice

Literature on Catering, etc.

8,792. *Required, details of any publications dealing with catering, canteen management, etc., particularly any handy pocket publications that might be available to canteen managers.* (Co. Durham.)

The following four books should be of interest to you :

Practical Canteen Catering. 1942. 64 pp. 2s. Food facts. Soups. Fish. Meat, cheese and vegetable dishes. Sauces. Hot puddings. Sweet Pastry. Milk puddings. Cold puddings. Cakes. Snacks and sandwiches. Salads and hors d'œuvres. Dinner menus.

Canteen Catering. 1942. 84 pp. 6d. Planning of meals in canteens. Foods of which the supply is variable or reduces preparation or cooking of vegetables. Canteen menus. Standard methods. Approximate size of servings per person. Index to recipes for midday meals, for use in Scotland. Light summer meals. Subsidiary meals. Index to subsidiary meals.

Canteens at Work. C. C. Gardiner. 1941. 104 pp. 4s. 6d. The case for the canteen. Planning layout and design. Planning kitchen equipment. Planning the servery. Planning the washup. Planning tea equipment and service. Planning the dining hall. Managing the food. Managing the staff. Managing the finance. Appendix. Index.

Handbook of Institutional Catering. D. Grange and W. H. Turpin. 1943. 2s. 6d.

An article which appeared in the March, 1943, issue of FOOD MANUFACTURE, p. 79, dealt with the subject of factory canteens very comprehensively.

Tomato Ketchup

8,851. *Required, a suitable wartime formula for the manufacture of tomato ketchup on a small scale.* (N. Ireland.)

The following is an old recipe which should constitute a basis for experiment :

Crush and boil for one hour 1 bushel of tomatoes, press through a nickel sieve, and put back in the kettle, boiling three hours longer. It must then be a heavy pulp. Add—

Salt	½ lb.
Sugar	½ lb.
Special spices	8 ozs.

and 2 quarts of strong vinegar in which ½ lb. of chopped shallots have been boiled for twenty minutes.

Boil the ketchup fifteen minutes more, bottle hot, sealing with the Phœnix caps. Process the bottles in boiling water bath if you so desire.

TOMATO KETCHUP SPECIAL SPICES

To prepare the special spices, mix and grind together the following :

Black pepper ...	1 lb.	Cinnamon ...	½ oz.
Dried red peppers	5 ozs.	Coriander ...	½ ,,
Cayenne pepper...	¼ oz.	Thyme	½ ,,
Grated nutmeg...	1 ,,	Bay leaves ...	1 ,,
Cloves	1½ ozs.		

Custard Powder

8,868. *Required, recipes for custard powder.* (Kent.)

We gave the following recipes for pre-war custard powder in FOOD MANUFACTURE in 1931 :

You might use as a basis 60 lbs. of cornflour and 40 lbs. of arrowroot, but formulæ and method in detail depend on the plant available, quality of product, amount of care bestowed, and so on. Mix the vanillin or essence of vanilla intimately with four times its weight of the main bulk of cornflour and arrowroot mixture. If a coloured product is desired, the powder colour should first be dissolved in warm water in the proportion of ½ oz. to the pint, and this solution is then thoroughly ground into the batch, which should afterwards be dried. To make sure that the colour is evenly distributed throughout, the dried powder should be milled, which will avoid specks. Finally, add the concentrated flavoured powder to the coloured base and well mix with the aid of a good mixing machine.

The basis of custard powder is usually a mixture of two or more of the following : Cornflour, arrowroot, rice flour, and potato flour, together with, in some cases, whole dried powdered eggs, sugar, or gum tragacanth. The mixture is suitably coloured and flavoured.

Thus 60 parts by weight of cornflour and 40 parts of arrowroot might be used as a basis, or equal parts of fine rice flour and potato flour, generally the former.

The colouring matter is usually egg yellow and the flavour vanilla or almond. Mixing should be very intimate and thorough, especially with reference to the colour and flavour. Take particular note of the temperature at which the powder gelatinises, and the colour of the paste.

Information Supplied

8,839. *Names of firms occupied in the dehydration of foods.* (Lancs.)

8,850. *Literature on the manufacture of biscuits.* (Nigeria.)

8,852. *Makers of tableting machines.* (Scotland.)

8,855. *Suppliers of equipment for mechanically lining "A1 Tall" cans with dough for meat puddings.* (London.)

8,869. *Suppliers of large tin openers.* (Lancs.)

8,872. *Information on the manufacture of baking powders.* (Surrey.)

8,873. *Makers of strong paper bags.* (Derbyshire.)

8,887. *Formula for a fat extender.* (Lancs.)

Information Required

8,926. *Required, information on the process for producing a "whole sugar" by the dehydration of cane juice clarified by mechanical means alone—that is, without recourse to the chemical clarifications ordinarily used for the purpose.* (New York.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Improvements in the Treatment of Food by Heat Transference

The present invention relates to improvements in the treatment of food by heat transference, that is to say by imparting heat to food, as in cooking or baking, or in withdrawing heat from foodstuffs, as in refrigeration.

Normally the cooking of foodstuffs is effected by radiant heat from electric radiant elements or gas burners or by convection currents set up by such heating elements. The heat transference efficiency obtained by convection currents is low, due to the low velocity of passage of the heating steam relatively to the body to be heated.

It has been proposed to heat cooking vessels by means of steam, but in this case the steam has either been static or, where moving, has been of low velocity, giving a low efficiency of heat transfer and special devices are necessary to avoid escape of steam from the heating chamber. It has also been proposed to circulate heated or cooled air through a chamber containing foodstuff in closed cycle by means of a fan, the air entering through short tubes emerging from a V-shaped outlet to an air chamber and leaving through perforations on the opposite side of the chamber containing the foodstuffs controlled by rotary valves.

A cooking, baking or refrigerating apparatus for the treatment of food by heat transference comprises a chamber in which the walls have air inlet and air outlet nozzles oppositely disposed to one another leading from an air compression and to an air suction chamber respectively, means being provided to feed heated or cooled air to the compression chamber and exhaust it from the suction chamber in a closed cycle including a heating or cooling means for the air.

The invention is equally applicable to the baking of foodstuffs, such as bread or biscuits, and to arrangements where food in its treatment is first cooked or baked and then cooled, as in bread making, in which case the loaves, which may be on a travelling conveyor, would pass through a heating oven and then through a cooling chamber, and, further, the bread loaves may also, prior to passing through the heating chamber, be passed through a proving chamber heated again in a similar manner.

The invention is equally applicable to where the heating source is gas, coal or oil, and electricity.

550,920. William Wycliffe Spooner.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

551,420. HURDEN, E., and SNELLING, J. C.: Hoods or canopies intended to be suspended or fixed above cooking or other similar appliances.

551,428. TRIGGS, W. W. (Standard Brands, Inc.): Treatment of molasses for use in the manufacture of yeast or alcohol.

551,430. COTY (ENGLAND), LTD., and GRAHAM, K. L.: Bottles or the like.

551,465. ROBINSON, F. G., and PAPER SACKS, LTD.: Blockbottom closures for multiple paper bags or sacks.

551,480. SPEIGHT, J.: Mills for grinding flour and the like.

551,505. PAGE, M. W. FLOOD-, and MELDRUMS, LTD.: Mechanical stokers.

551,506. BRINDLEY, C. V.: Filter grates used in funnels for filtering liquids.

551,517. ACKERMANN, M., and SAFFER, L.: Method of and apparatus for measuring and indicating the level and/or quantity of liquid in a container.

551,531. AUTO-KLEAN STRAINERS, LTD., BELDAM, W. R., and FREEMAN, J. E.: Straining or filtering apparatus.

551,533. AFRICAN SISAL AND PRODUCE CO., LTD., WALSH, C. L., and BROWNE, R. J.: Method of and means for dehydrating organic solvents, petrols, oils and the like.

551,540. SMALLEY, W.: Apparatus for effecting the proportional addition of one liquid to another.

551,618. BELLING AND CO., LTD., and BELLING, C. R.: Electric boiling and cooking apparatus.

551,637. WAXED-PAPERS, LTD., and TUBBS, L. E.: Wrappers particularly for confectionery.

551,642. FREWIN, S. R.: Means for automatically controlling the supply of heat to water-boilers.

551,650. TRIGGS, W. W. (U.S. Vitamin Corporation): Method of and apparatus for extraction.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

RISING GLORY.—622,266. Self-raising flour, cake flour, batter flour, Yorkshire pudding and pancake mixture, semolina and rice and maize mixture for moulds and puddings, preparations consisting mainly of baking powder and binding materials for use in the bakery and confectionery trades, baking powder, and flavoured mould mixture in the nature of jelly or blancmange. **Sunmill Food Products, Ltd.**, 4, Vestry Street, London, N. 1; Merchants.

LINGUETS.—622,639. Sweets (not medicated). **Society of Chemical Industry in Basle** (a Joint Stock Company organised under the laws of Switzerland), 141-227, Klybeckstrasse, Basle, Switzerland; Manufacturers and Merchants. Address for service is c/o Abel and Imray, Quality House, Quality Court, London, W.C. 2. To be Associated with No. 615,887 (3314) v.

KRISVITA.—622,411. Crispbread. **James Mitchelhill,** "Healthy Life" Biscuit Factory, Peffermill Road, Craigmillar, Edinburgh, 9; Baker.

New Companies

Copperad, Limited. (378703.) Pinners Hall, Austin Friars, E.C. 2. To carry on bus. of heating, ventilating and refrigerating engineers, etc. Nom. cap.: £100 in £1 shares. Dirs.: J. P. Tilley, Ranworth, Oxshott, Surrey; A. Wilyman, Wykham Park Lodge, Banbury, Oxon; E. B. T. Tanner, Garden Cottage, Quarry Wood Hall, Marlow, Bucks.

K.P.F., Limited. (378710.) Station Hill, Kidderminster, Worcs. To carry on bus. of mfrs. of poultry, cattle and animal foods, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: J. H. Rowland, Russell Road, Kidderminster; A. G. Brockway, 253, Chester Road North, Kidderminster.

Makmor Products, Limited. (380301.) 2, Malton Street, Plumstead, S.E. 18. To carry on bus. of manufacturers of and dealers in sugar, sweetened sugar, sweeteners, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: B. Alderton, 10, North Park, Eltham, S.E. 9; P. Alderton, 65, Shrewsbury Lane, S.E. 18.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.